United States Department of the Interior
Bureau of Land Management

Battle Mountain Field Office
Battle Mountain, Nevada

July 2005

Ruby Hill Mine Expansion – East Archimedes Project

Final Supplemental Environmental Impact Statement

NVN-067762
NV063-EIS04-34

COOPERATING AGENCIES:
Eureka County
Nevada Department of Wildlife

BLM Mission Statement

The Bureau of Land Management is responsible for the stewardship of our public lands. It is committed to manage, protect, and improve these lands in a manner to serve the needs of the American people for all times.

Management is based upon the principles of multiple use and sustained yield of our nation's resources within a framework of environmental responsibility and scientific technology. These resources include recreation, rangelands, timber, minerals, watershed, fish and wildlife, wilderness, air and scenic, scientific, and cultural values.

BLM/BM/PL-05/018+1793

Cover: Aerial photograph of the existing Ruby Hill Mine (2002). View is from the northwest looking southeast.

FINAL
SUPPLEMENTAL ENVIRONMENTAL IMPACT STATEMENT
RUBY HILL MINE EXPANSION – EAST ARCHIMEDES PROJECT

Lead Agency:	U.S. Department of the Interior Bureau of Land Management Battle Mountain Field Office
Cooperating Agencies:	Nevada Department of Wildlife Eureka County
Project Location:	Eureka County, Nevada
Correspondence on This SEIS Should be Directed to:	Caleb Hiner, SEIS Project Manager Bureau of Land Management Battle Mountain Field Office 50 Bastian Road Battle Mountain, NV 89820 (775) 635-4000

ABSTRACT

Homestake Mining Company, a wholly owned subsidiary of Barrick Gold Corporation, proposes to expand its Ruby Hill Project, an existing gold mining and processing operation. The Ruby Hill Project is located within the historic Eureka Mining District in Eureka County, approximately 0.7 mile northwest of Eureka, Nevada. The Ruby Hill Mine Expansion – East Archimedes Project (Proposed Action) would be developed within the previously approved Ruby Hill Mine permit area. The proposed expansion would include an extension of the existing open pit, expansion of two existing waste rock disposal areas, expansion of the existing heap leach pad, and construction of dewatering facilities. Portions of the existing power line would be relocated for the expansion. The Proposed Action would require surface disturbance of approximately 744 acres, including 190 acres of public land administered by the Bureau of Land Management and 554 acres of private land owned by Homestake. The anticipated mine life would be approximately 7 years, followed by an estimated additional 2 years for final reclamation.

This Supplemental Final Environmental Impact Statement analyzes the environmental effects of the Proposed Action and the No Action Alternative.

Responsible Official for SEIS:	Gerald M. Smith Field Manager Battle Mountain Field Office

EXECUTIVE SUMMARY

Proposed Action

Homestake Mining Company, a wholly owned subsidiary of Barrick Gold Corporation, proposes to expand its Ruby Hill Project, an existing gold mining and processing operation. The Ruby Hill Project is located within the historic Eureka Mining District in Eureka County, approximately 0.7 mile northwest of Eureka, Nevada (see Chapter 1.0, **Figure 1-1**). The Proposed Action would include mine development and surface disturbance on a total of approximately 744 acres, of which 190 acres is public land administered by the Bureau of Land Management (BLM) and 554 acres is private land owned by Homestake.

Approximately 18 million tons of ore, 60 million tons of rock overburden, and 130 million tons of alluvial overburden would be removed during mine operations. The proposed expansion would include an extension of the existing open pit, expansion of two existing waste rock disposal areas, expansion of the existing heap leach pad, and construction of dewatering facilities. Portions of the existing power line would be relocated for the expansion. The proposed expansion would utilize the existing grinding circuit, solution processing plant, and ancillary support facilities. The anticipated mine life would be approximately 7 years, followed by an estimated additional 2 years for final reclamation.

No Action Alternative

Under the No Action Alternative, the proposed expanded facilities that comprise the Ruby Hill Mine Expansion – East Archimedes Project would not be constructed. Homestake would continue to recover gold and silver at the existing heap leach facilities as currently authorized by the BLM and State of Nevada for the existing Ruby Hill Project.

Summary of Impacts

Air Quality

Modeling results for the mine expansion indicate that maximum concentrations of particulate matter with an aerodynamic diameter of 10 microns or less, nitrogen dioxide, carbon monoxide, and sulfur dioxide would not exceed Nevada or National Ambient Air Quality Standards. There would be no impacts to Prevention of Significant Deterioration Class I areas as a result of the mine expansion.

Geology and Minerals

Direct impacts to geologic and mineral resources as a result of the mine expansion would include the generation and disposal of approximately 60 million tons of rock overburden, 130 million tons of alluvial overburden, and 18 million tons of ore. In addition, approximately 744 acres of alluvial fan deposits would be disturbed. Mined ore permanently would be removed from existing reserves.

Paleontology

No impacts to scientifically significant or critical fossil resources are anticipated as a result of ground-disturbing activities associated with the mine expansion.

Water Quality and Quantity

Surface Water Quantity. The proposed mine expansion is not expected to have a substantial impact on surface water quantity due to the absence of perennial streams in the project area; intermittent stream segments would be removed or filled during construction of the East Archimedes Pit. No impacts to seeps or springs are expected from mine expansion activities.

Surface Water Quality. Mine expansion-related sedimentation effects on surface waters would be minimal based on the lack of perennial surface waters in the project area and the implementation of erosion control measures (e.g., silt fences, straw bales, etc.) and concurrent reclamation during mine operations. No impacts to surface water quality are anticipated in association with the proposed expansion of the waste rock disposal areas based on the proposed reclamation procedures that would be implemented.

Waste Rock Management. Based on geochemical tests conducted on potential waste rock from the proposed pit expansion area, the low percentage of sulfide-bearing rock (less than 3 percent) that would comprise the waste rock that would be mined, the proposed placement of the sulfide-bearing waste rock below the final surface of the waste rock facilities, and the proposed reclamation methods, acidic or metal-laden seeps are not expected from the proposed waste rock expansion areas.

Groundwater Quantity. Withdrawal of approximately 500 to 1,000 gallons per minute of groundwater from the carbonate bedrock over a period of 7 years for mine dewatering purposes would result in a maximum drawdown of 10 feet in the alluvial aquifer northeast of the project. No impacts as a result of this drawdown have been identified for irrigation wells in the southern part of Diamond Valley. Backup water supply wells in the town of Eureka would be within the projected groundwater drawdown area and could experience up to 20 feet of drawdown. The town of Eureka, Nevada, would experience 10 to 20 feet of drawdown in the bedrock aquifer beneath the town as a result of dewatering. Due to the type of geologic material under the town (volcanic and carbonate bedrock) no subsidence-related effects would be anticipated in this location. However, groundwater drawdown potentially would result in a maximum ground subsidence of approximately 0.1 to 0.25 foot along U.S. Highway 50 north of Eureka, Nevada. Subsidence effects on public facilities would depend on the actual amount of subsidence, specific geologic material in the area of subsidence (alluvium), and the type of facility affected. Approximately 40 years would be required for groundwater levels to recover to 95 percent of present levels. Water pumped for pit dewatering in excess of operational needs would be returned to the local aquifer through injection or infiltration into the alluvial aquifer. Reinjection/infiltration would create a temporary, localized groundwater mound. Producing wells northwest of the mine site in the vicinity of U.S. Highway 50 could experience an associated temporary rise in the alluvial water table of approximately 10 to 50 feet.

Groundwater Quality. No groundwater quality impacts are anticipated as a result of injection/infiltration activities or development of the waste rock disposal facility expansion areas. Groundwater contamination by leach solution is not anticipated from the operation of the heap leach pad expansion.

Pit Lake Formation. Based on groundwater modeling results, it is anticipated that the post-mining pit lake water quality would be within Nevada stock water standards for all constituents.

Soils

Approximately 744 acres of soil would be disturbed during development of the mine expansion. Growth media from the 100-acre pit expansion area would be salvaged and stockpiled, as necessary, for use in reclamation.

Vegetation Resources

General Vegetation Impacts. Mine development and operation would remove or disturb approximately 744 acres of vegetation, inclusive of approximately 451 and 293 acres that would occur in tree-dominated and shrub-dominated communities, respectively. Long-term impacts would occur as a result of the conversion of tree-dominated communities to grass/forb-dominated communities. Reclamation would be completed on all mine disturbance areas except for the 100-acre pit expansion area.

Special Status Species. No impacts to special status plant species have been identified as a result of mine expansion activities.

Range Resources

Development and operation of the proposed mine expansion would result in the temporary loss of 34 animal unit months on public land during the life of the mine and the permanent loss of 3 animal unit months.

Woodland Products

The long-term change in vegetation and loss of woodland productivity as a result of the proposed mine expansion would not result in substantial impacts since the project area is located within an area where abundant pinon-juniper woodlands exist on public lands. Singleleaf piñon trees on BLM-administered lands within the proposed disturbance area would not be available for Christmas tree cutting in the long term.

Invasive and Non-native Species

Additional populations of invasive and non-native species are not anticipated to become established within the project area in the long term with the successful reclamation of mine disturbance areas and implementation of weed control practices.

Wildlife Resources/Terrestrial Wildlife

Wildlife Habitat. Approximately 744 acres of habitat would be disturbed as a result of mine expansion-related activities. Approximately 100 acres of terrestrial habitat associated with the pit expansion would not be reclaimed. Development of a post-mining pit lake, which is projected to be within Nevada stock water standards, potentially would result in an increase in habitat for waterfowl and aquatic species.

Mule Deer. Approximately 456 acres of year-long range, and approximately 288 acres of low-density range, would be disturbed as a result of mine expansion-related activities. Approximately 100 acres of this disturbance would be associated with the pit expansion and would not be reclaimed. Associated impacts to mule deer are anticipated to be low.

Impacts to Breeding Birds. Direct impacts to bird species as a result of the proposed project would include the temporary loss of approximately 644 acres, and permanent loss of approximately 100 acres, of potentially suitable breeding, roosting, and foraging habitat. Potential direct impacts to breeding birds (i.e., loss of nests, eggs, or young) would be minimized through the clearing of vegetation outside of the breeding season, to the extent possible, and the implementation of breeding bird surveys and appropriate mitigation, as needed, in coordination with the BLM and Nevada Department of Wildlife.

Human Presence and Noise. Increased noise, traffic, and human presence associated with mine development and operation is expected to result in negligible to low impacts to wildlife species.

Cyanide Effects. Fences, wildlife exclusion devices (e.g., netting or floating material), and piping would be installed to prevent access of wildlife to cyanide solutions. The potential for impacts to wildlife resources from cyanide ingestion would be low.

Potential for Hazardous Materials Spill Effects to Wildlife. The potential for impacts to wildlife in the event of a hazardous materials spill would be highest if spilled material entered aquatic habitat; however, the probability of a spill into aquatic habitats along the transportation corridor would be low.

Potential Impacts to Wildlife Associated with Pit Lake Water Quality. Based on modeling results, the pit lake waters would meet Nevada stock water standards. ***In addition, the predicted pit lake water quality was evaluated in relation to U.S. Environmental Protection Agency criteria and Nevada standards for aquatic life, as well as the no observed adverse effect level benchmarks for drinking water consumption (Sample et al. 1996) for representative species. These evaluations indicate that the predicted water quality of the pit lake would not pose unacceptable risks to wildlife, either mammals or birds.***

Wildlife Resources/Special Status Species

Golden Eagles. Potential impacts to golden eagles as a result of mine expansion-related activities would include the temporary loss of approximately 644 acres of foraging habitat, until reclamation has been completed and vegetation has been reestablished, and the permanent loss of approximately 100 acres of potential foraging habitat in association with the pit expansion. The impact would be considered negligible based on the overall availability of suitable foraging habitat in the vicinity.

Ferruginous Hawks. Potential direct impacts to breeding ferruginous hawks as a result of the proposed project could include abandonment of a breeding territory or nest site or the potential loss of eggs or young, which would reduce productivity for that breeding season. Based on the implementation of breeding bird surveys and appropriate mitigation, as needed, the results of the on site monitoring program conducted between 1997 and 2004, and the existing level of activity at the mine site, potential impacts to breeding ferruginous hawks would be considered low to moderate. Long-term impacts to this species would result from the loss of approximately 359 acres of juniper woodlands until mature juniper trees have reestablished in the project disturbance areas. The proposed pit expansion would result in the permanent loss of approximately 92 acres of potential juniper woodland breeding habitat. In addition, direct impacts would include the temporary loss of approximately 644 acres of potential foraging habitat, until reclamation has been completed and vegetation has been reestablished, and the permanent loss of approximately 100 acres of foraging habitat as a result of the pit expansion. The impact to the availability of foraging habitat would be considered negligible based on the overall availability of suitable foraging habitat in the vicinity.

Swainson's Hawks. Direct impacts to this species as a result of the proposed project would include the temporary loss of approximately 644 acres of potential foraging habitat, until reclamation has been completed and vegetation has been reestablished, and the permanent loss of approximately 100 acres from the proposed pit expansion area. This impact would be considered negligible based on the overall availability of suitable foraging habitat in the vicinity.

Prairie Falcon. Direct impacts to prairie falcon as a result of development and operation of the mine expansion would include the temporary loss of approximately 644 acres of potential foraging habitat, until reclamation has been completed and vegetation has been reestablished, and the permanent loss of approximately 100 acres from the proposed pit expansion area. This impact would be considered negligible based on the overall availability of suitable foraging habitat in the vicinity.

Greater Sage Grouse. Direct impacts to this species as a result of the proposed project would include the long-term loss of approximately 233 acres of wintering sagebrush habitat and the permanent loss of approximately 8 acres of wintering habitat in association with the pit expansion area. This impact would be considered negligible based on the overall availability of suitable wintering habitat in the vicinity.

Burrowing Owl. Potential direct impacts to breeding owls (i.e., loss of nests, eggs, or young) would be minimized by the clearing of vegetation outside of the breeding season, to the extent possible, and breeding bird surveys and implementation of appropriate mitigation, as needed, in coordination with the BLM and NDOW. Direct impacts to this species could include the short-term loss of approximately 278 acres of potential grassland breeding and foraging habitat, until reclamation has been completed and vegetation has been reestablished, and the permanent loss of approximately 3 acres of breeding and foraging habitat in association with the pit expansion. This impact would be considered negligible based on the overall availability of suitable breeding and foraging habitat in the vicinity.

Pinyon Jay. Potential direct impacts to breeding jays (i.e., loss of nests, eggs, or young) would be minimized by the clearing of vegetation outside of the breeding season, to the extent possible, and breeding bird surveys and implementation of appropriate mitigation, as needed, in coordination with the BLM and NDOW. Long-term impacts would result from the long-term loss of approximately 359 acres, and permanent loss of approximately 92 acres, of potential juniper woodland breeding and foraging habitat, until mature juniper trees have reestablished in project disturbance areas. This impact would be considered negligible based on the overall availability of suitable breeding and foraging habitat in the vicinity.

Vesper Sparrow. Direct impacts to breeding pairs as a result of mine expansion-related activities, and the environmental protection measures that would be implemented to minimize these impacts, would be similar to those described for the pinyon jay. Direct impacts to this species would include the temporary loss of approximately 233 acres of potential sagebrush breeding and foraging habitat, until reclamation has been completed and vegetation has been reestablished, and the permanent loss of approximately 8 acres of potential foraging habitat in association with the proposed pit expansion. This impact would be considered negligible based on the overall availability of suitable breeding habitat in the vicinity.

Juniper Titmouse. Long-term impacts to this species as a result of the proposed project would result from the long-term loss of approximately 359 acres, and the permanent loss of approximately 92 acres, of potential juniper woodland foraging habitat, until mature juniper trees have reestablished in project disturbance areas.

Loggerhead Shrike. Direct impacts to breeding pairs as a result of mine expansion-related activities and applicable environmental protection measures to minimize these impacts would be similar to those described for the pinyon jay. Direct impacts to this species would include the temporary loss of approximately 644 acres of potential breeding and foraging habitat, until reclamation has been completed and vegetation has been reestablished, and the permanent loss of approximately 100 acres of nesting and foraging habitat in association with the pit expansion.

Bats. Direct impacts to bat species as a result of mine expansion-related activities would include the loss of foraging habitat, including the short-term loss of approximately 52 acres of grassland habitat, long-term loss of approximately 592 acres of shrub and woodland habitat, and the permanent loss of approximately 100 acres of shrub and woodland habitat in association with the pit expansion. The direct loss of potential roosting habitat would occur as a result of the burial of the Silver West Complex. If this complex, or the mine openings in the vicinity of the Bullwhacker, Holly, and Williamsburg mines which also would be closed, have underground connections with the occupied adits in the mine area, their closure could alter air flow in the remaining underground workings at the mine site. Alteration of air flow indirectly could affect the continued suitability of the workings as hibernacula and/or maternity roosts. Blasting could have a similar effect on air flow and related habitat suitability if the vibrations result in the shifting of underground structures. Also, noise or vibrations from mine blasting could affect hibernating bats (depending on species' sensitivity), and could lead to the loss of maternity roosts, nursery colonies, or hibernacula, which would be considered an adverse impact to the local bat population. Maintenance of existing bat gates, construction of cupola structures, and ongoing monitoring would be implemented to minimize impacts to bat species.

Pygmy Rabbit. Development of mine expansion facilities would result in the long-term loss of approximately 233 acres, and permanent loss of approximately 8 acres, of potentially suitable sagebrush habitat for this species. This impact would be considered low to moderate, depending on the relative habitat quality. Project construction likely would result in the direct mortalities of individual rabbits, if present. The loss of individual pygmy rabbits would not result in population-level effects.

Land Use Authorizations and Access

Land Use Authorizations. Approximately 112 acres of public land that have been determined by the BLM to be suitable for disposal would not be available during mining, approximately 25 acres of which would be permanently excluded as a result of the pit expansion. No associated impacts to the potential future growth of Eureka are expected based on the availability of disposal lands adjacent to the current town boundary.

Rights-of-way. An approximately 0.1-mile-long section of the existing power line for the Ruby Hill Mine would be relocated for the mine expansion; the utility right-of-way would be on private land.

Access. Ore hauling from the Ruby Hill Mine site to the Goldstrike Mine during mine expansion operations would have minimal impact on State Highway 278 north and a slight impact to the town of Carlin. Access to public and private lands in the study area would not be adversely affected.

Closure/reclamation. Closure, abandonment, and reclamation following the completion of mining would return public lands to their pre-mining land use, except for the pit expansion area. With the exception of the pit expansion area, disturbance areas would be recontoured and revegetated, and access to public lands would be reestablished.

Recreation and Wilderness

No parks, concentrated recreational use areas, BLM Wilderness Study Areas, designated wilderness areas, or protected natural areas would be directly affected. Approximately 190 acres of public lands would not be available for dispersed recreation during mining, approximately 25 acres of which would be permanently excluded as a result of the pit expansion. The reduction of land available for dispersed recreation would be a minimal adverse impact, based on current usage and the availability of public, open-space lands in the area.

Visual Resources

Construction of the proposed project facilities would be consistent with the applicable BLM Visual Resource Management objectives. Assuming the proposed reclamation program is successful, the visual contrast would be reduced over time as viewed from each of the three Key Observation Points.

Noise and Blasting Vibrations

Noise from mine expansion-related operations would be perceptible at nearby sensitive receptors but generally would remain below 55 decibels, A-weighted, equivalent continuous sound level, the standard for community noise levels. Substantial noise impacts from blasting would not be expected to occur. Based on review of previous blasting studies, and adjusting for the location of the pit expansion area and blasting weights, the potential that any structure in the Eureka area would be damaged as a result of blasting vibration was determined to be less than 1 in 50 million.

Cultural Resources

No known National Register of Historic Places-eligible sites within the proposed mine expansion areas would be directly or indirectly affected by the proposed project.

Native American Traditional Values

Impacts to Native American traditional values are not anticipated as a result of mine expansion development and operation.

Social and Economic Values

Temporary increases in local construction jobs and longer-term increases in mining sector employment in Eureka County would occur as a result of the mine expansion. Labor earnings in those industries would provide an economic stimulus to the local economy. Expenditures made locally by Homestake and its employees and contractors would support increased local private- and public-sector employment in Eureka. Mine expansion would result in a higher demand for local housing, increasing housing values and rents, and additional construction. Tax revenues would increase for Eureka County and the school district, as would demands for public services.

Hazardous Materials and Solid Waste

There would be a low probability of an accident involving the release of hazardous materials during the life of the mine. The number of chemical or fuel releases that potentially would occur is projected at approximately 0.03. Operations would be conducted in accordance with the existing Spill Prevention, Control, and Countermeasure Plan, which would ensure that impacts from potential spills would be minimized and the spilled materials contained and removed. Implementation of the existing Emergency Response and Contingency Plan in the event of a hazardous materials spill also would assist in minimizing impacts.

Environmental Justice

The potential mine expansion-related effects would not be expected to disproportionately affect any particular population.

<u>BLM-preferred Alternative</u>

Chapter V, Section B.2.b. of the BLM's National Environmental Policy Act Handbook directs that "the Manager responsible for preparing the EIS should select the BLM's preferred alternative. ... For externally initiated proposals, ... the BLM selects its preferred alternative unless another law prohibits such an expression. ... The selection of the preferred alternative should be based on the environmental analysis as well as consideration of other factors that influence the decision or are required under another statutory authority."

The BLM has selected a preferred alternative based on the analysis in this SEIS. This preferred alternative is the alternative that best fulfills the agency's statutory mission and responsibilities, considering economic, environmental, technical, and other factors. The BLM has determined that the preferred alternative is the Proposed Action as outlined in Chapter 2.0 with the mitigation measures specified in Chapter 3.0 of this SEIS.

ACRONYMS AND ABBREVIATIONS

AAQS	ambient air quality standards
ABA	acid-base accounting
ACHP	Advisory Council on Historic Preservation
ADR	adsorption, desorption, and recovery
AGFD	Arizona Game and Fish Department
AIRFA	American Indian Religious Freedom Act
amsl	above mean sea level
BLM	Bureau of Land Management
CEQ	Council on Environmental Quality
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFR	Code of Federal Regulations
cm/sec	centimeters per second
CO	carbon monoxide
dBA	decibels, A-weighted
EA	environmental assessment
ECSD	Eureka County School District
EHS	extremely hazardous substances
EIS	environmental impact statement
EO	Executive Order
EPCRA	Emergency Planning and Community Right-to-Know Act
ERA	ecological risk assessment
ESA	Endangered Species Act
°F	degrees Fahrenheit
ft/sec	feet per second
FLPMA	Federal Land Policy and Management Act
gpd/ft	gallons per day per foot
gpm	gallons per minute
gpm/ft^2	gallons per minute per square foot
GPS	Global Positioning System
H	horizontal
I	Interstate
ISC3	Industrial Source Complex
JBR	JBR Environmental Consultants, Inc.
KOP	key observation point
kV	kilovolt
L_{dn}	day-night average sound levels
L_{eq}	equivalent continuous sound level
L_{max}	maximum noise level
µg	micrograms
µg/L	micrograms per liter
µg/m^3	micrograms per cubic meter
µm	micrometer
m/s	meters per second

mg/kg	milligrams per kilogram
mg/L	milligrams per liter
MIG	Minnesota IMPLAN Group
mph	miles per hour
MSDS	material safety data sheet
MSHA	Mine Safety and Health Administration
MWMP	meteoric water mobility procedure
NAAQS	National Ambient Air Quality Standards
NAC	Nevada Administrative Code
NAGPRA	Native American Graves Protection and Repatriation Act
NDEP	Nevada Division of Environmental Protection
NDOT	Nevada Department of Transportation
NDOW	Nevada Department of Wildlife
NEPA	National Environmental Policy Act
NHPA	National Historic Preservation Act
NNHP	National Natural Heritage Program
NNP	net neutralization potential (acid neutralization potential/acid generation potential)
NO_2	nitrogen dioxide
NPIF	Nevada Partners in Flight
NRCS	National Resources Conservation Service
NRHP	National Register of Historic Places
OSHA	Occupational Safety and Health Administration
PA	Programmatic Agreement
PM_{10}	particulate matter with an aerodynamic diameter of 10 microns or less
ppm	parts per million
PSD	Prevention of Significant Deterioration
R	Range
RFFA	reasonably foreseeable future action
RMP	Resource Management Plan
ROD	Record of Decision
ROW	right-of-way
RV	recreational vehicle
SARA	Superfund Amendments and Reauthorization Act
SEIS	supplemental environmental impact statement
SHPO	State Historic Preservation Officer
SO_2	sulfur dioxide
SPCC Plan	Spill Prevention, Control, and Countermeasure Plan
SR	State Route
SWPPP	Storm Water Pollution Prevention Plan
T	Township
T/kt	tons per kiloton
TDS	total dissolved solids
TPQ	threshold planning quantity
USACE	U.S. Army Corps of Engineers

USDOT	U.S. Department of Transportation
USGS	U.S. Geological Survey
USEPA	U.S. Environmental Protection Agency
USFWS	U.S. Fish and Wildlife Service
V	vertical
VFS	Volunteer Fire Service
VOCs	volatile organic compounds
VRM	Visual Resource Management
WCRM	Western Cultural Resource Management, Inc.
WESTEC	Welsh Engineering Science and Technology Incorporated
WMC	Water Management Consultants
WSA	wilderness study area
WUS	waters of the U.S.

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1.0 INTRODUCTION

1.1 Proposed Action

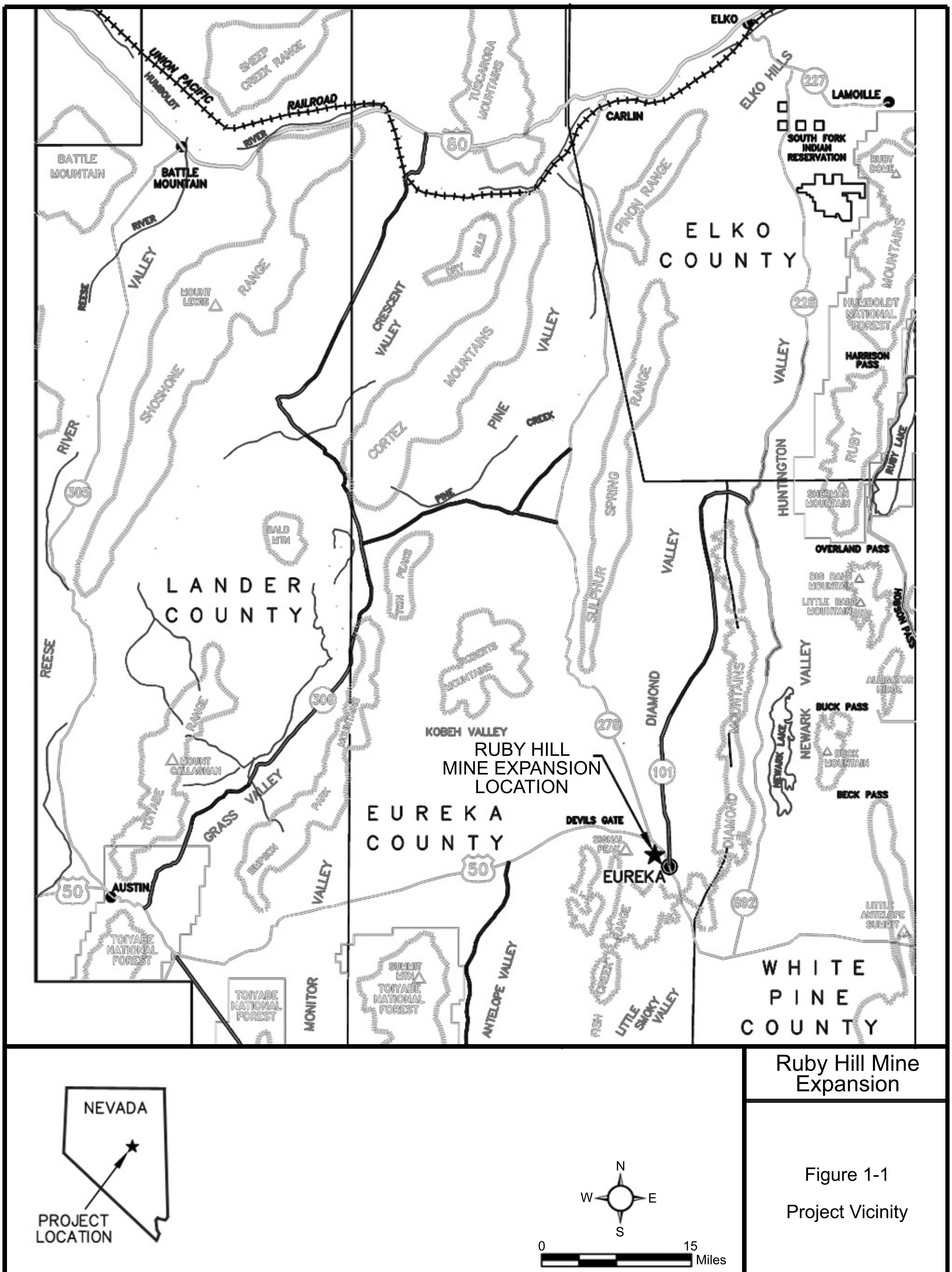
Homestake Mining Company of California (Homestake), a wholly owned subsidiary of Barrick Gold Corporation, proposes to expand its Ruby Hill Project, an existing open-pit gold mining and processing operation. The Ruby Hill Project is situated within the historic Eureka Mining District in Eureka County, Nevada, approximately 0.7 mile northwest of Eureka, Nevada (see **Figure 1-1**). The expanded project facilities and activities would be developed within the previously approved Ruby Hill Mine permit area, which is located in the southern portion of Township 20 North (T20N), Range 53 East (R53E) and the northern portion of T19N, R53E.

The Bureau of Land Management (BLM) prepared an Environmental Impact Statement (EIS), in compliance with the National Environmental Policy Act of 1969 (NEPA), for the initial Ruby Hill Project. The BLM issued the Ruby Hill Project Final EIS in January 1997 (BLM 1997a). The BLM issued the Ruby Hill Project Record of Decision (ROD) and Plan of Operations Approval on February 3, 1997 (BLM 1997b). In 2003, the BLM prepared an environmental assessment for the sale of approximately 1,644 acres of BLM-administered land to Homestake (BLM 2003a). The land sale, completed in August 2003, transferred surface ownership only.

The proposed Ruby Hill Mine Expansion – East Archimedes Project (Proposed Action) would include new surface disturbance on approximately 744 acres within the 1997 approved project area. The 744 acres includes 190 acres of public land administered by the BLM and 554 acres of private land owned by Homestake. The proposed expansion would include an extension of the existing open pit, expansion of two existing waste rock disposal areas, expansion of the existing heap leach pad, and construction of dewatering facilities. The proposed expansion would utilize the existing grinding circuit, solution processing plant, and ancillary support facilities. Portions of the existing power line would be relocated for the expansion. If approved, the anticipated mine life would be approximately 7 years, followed by an estimated additional 2 years for final reclamation.

The proposed mining activities located on public and private lands are subject to review and approval by the BLM pursuant to the Federal Land Policy and Management Act of 1976 (as amended) (FLPMA) and the BLM's surface management regulations (43 Code of Federal Regulations [CFR] Subpart 3809). The BLM's review and approval of a mine plan of operations under the surface management regulations constitute a federal action that is subject to NEPA. The BLM has determined that the project constitutes a major federal action and has determined that a supplemental EIS (SEIS) must be prepared to fulfill NEPA requirements. A Notice of Intent to Prepare a Supplemental Environmental Impact Statement was published in the Federal Register on April 2, 2004 (69 Federal Register 17445). Public scoping meetings for the SEIS were held in Battle Mountain and Eureka, Nevada, on June 16 and 17, 2004, respectively. The comments received during the scoping process were considered in developing this SEIS.

The BLM is serving as the lead agency for preparing the SEIS in compliance with NEPA, the Council on Environmental Quality (CEQ) NEPA implementing regulations (40 CFR 1500-1508), the BLM's NEPA Handbook (H-1790-1), Nevada State Office Instruction Memorandum NV-90-435 on analysis of cumulative



Ruby Hill Mine Expansion

Figure 1-1

Project Vicinity

10/29/04

impacts, and the Bureau-wide Guidelines for Assessing and Documenting Cumulative Impacts (April 1994). The Nevada Department of Wildlife (NDOW) and Eureka County are serving as cooperating agencies for preparation and review of the SEIS.

This SEIS describes the proposed mine expansion (Proposed Action) and the No Action Alternative. It also describes the environmental consequences of implementing the Proposed Action or the No Action Alternative.

1.2 Purpose and Need for the Action

1.2.1 Homestake's Objectives

Homestake has environmentally responsible and economically driven project objectives, which include:

- Extraction of additional economically recoverable gold and other minerals determined to exist in the area;
- Expansion of the existing Ruby Hill Mine gold mining facilities to extract additional economically recoverable gold and other minerals determined to exist in the area;
- Operation and reclamation of the project area in an efficient, environmentally conscientious, and safe manner;
- Maintaining Homestake's high standards for ethical and responsible environmental stewardship; and
- Meeting or exceeding federal, state, and local regulations for the protection of human health, safety, and the environment.

1.2.2 BLM's Responsibilities and Relationship to Planning

The BLM has the responsibility and authority to manage the surface and subsurface resources on public lands located within the jurisdiction of the Battle Mountain Field Office. The lands within the project area are designated as open for mineral exploration and development.

The BLM's Shoshone-Eureka Resource Management Plan (RMP) (BLM 1986a) contains no constraints that conflict with the Proposed Action. It is noted that parts of the proposed mine expansion would be on lands designated suitable for disposal in the RMP; however, mineral resource development is in conformance with the RMP, which states that "all public lands in the planning areas will be open for mining and prospecting unless withdrawn or restricted from mineral entry." Relative to current mineral production areas, the RMP states that the Battle Mountain Field Office should "recognize these areas as having a highest and best use for mineral production and encourage mining with minimal disturbance. Make thorough examinations of all sites proposed for other Bureau programs in these areas."

In order to use public land managed by the Battle Mountain Field Office, Homestake must comply with the BLM Surface Management Regulations (as amended) (43 CFR 3809) and other applicable statues, including the Mining and Mineral Policy Act of 1970 (as amended) and FLPMA. The BLM must review Homestake's plans for developing the Ruby Hill Mine Expansion – East Archimedes Project to ensure that:

- Adequate provisions are included to prevent unnecessary or undue degradation of federal lands;
- Measures are included to provide for reclamation of disturbed areas; and
- Compliance with applicable state and federal laws is achieved.

1.3 Relationship to Non-BLM Policies, Plans, and Programs

Eureka County currently has no zoning ordinance to guide development of private lands within the county. The Eureka County 1973 General Plan, updated in 2000, contains a description of local land uses, restrictions on development, and recommendations for future land use planning. The county's Overall Economic Development Plan, approved by the County Commissioners in 1997, was developed in order to broaden the economic development of the county. Both of these plans contain recommendations for planning of land uses and designate the project area as being within land class "C," Open Space and Appropriate Uses, which includes mining. In addition, Eureka County, in cooperation with the Nevada Division of State Lands, has adopted a Policy for Public Lands within its jurisdiction (Eureka County 1985). This plan was developed in response to Nevada Senate Bill 40, which directs the State Land Use Planning Agency to work with local planning entities to prepare local plans and policy statements regarding the use of federal lands in Nevada. Policies contained within the plan include promoting expansion of mining operations/areas. The proposed mine expansion would be in conformance with these plans.

1.4 Project Permits and Approvals

In addition to the SEIS, implementing the Proposed Action would require authorizing actions from other federal, state, and local agencies with jurisdiction over certain aspects of the proposed project. **Table 1-1** lists the required permits or approvals that are already in place or will be obtained and the responsible regulatory agencies. Homestake is responsible for amending existing permits, as necessary, and applying for and acquiring additional permits, as needed.

Table 1-1
Major Permits and Approvals for the
Ruby Hill Mine Expansion – East Archimedes Project

Permit/Approval	Granting Agency
SEIS preparation Plan of Operations approval	U.S. Department of the Interior, BLM
Explosives Permit	U.S. Department of the Treasury, Bureau of Alcohol, Tobacco, and Firearms
Surface Disturbance Permit Permit to Operate	Nevada Department of Conservation and Natural Resources, Division of Environmental Protection (NDEP), Bureau of Air Pollution Control
Water Pollution Control Permit Reclamation Permit Bioremediation Facility General Permit	Nevada Department of Conservation and Natural Resources, NDEP, Bureau of Mining Regulation and Reclamation
Permit to Appropriate Water and/or Point of Diversion Changes	Nevada Department of Conservation and Natural Resources, Division of Water Resources
Underground Injection Permit	Nevada Department of Conservation and Natural Resources, NDEP
Industrial Artificial Pond Permit	NDOW
Approval to Operate a Sanitary Landfill	Nevada Department of Conservation and Natural Resources, NDEP, Bureau of Waste Management
General Discharge Permit (storm water)	Nevada Department of Conservation and Natural Resources, NDEP, Bureau of Water Pollution Control
Hazardous Materials Storage Permit	State of Nevada, Fire Marshal Division

2.0 ALTERNATIVES INCLUDING THE PROPOSED ACTION

2.1 Introduction

Homestake has submitted a Plan of Operations Amendment (Homestake 2003) for the proposed expansion of the Ruby Hill Mine to the BLM in compliance with 43 CFR 3809. This chapter describes the proposed Ruby Hill Mine Expansion – East Archimedes Project (Proposed Action) as described by Homestake in the Plan of Operations Amendment and associated supporting plans. Descriptions of other alternatives presented in this chapter are based on supporting information provided by Homestake and reviewed by the BLM. This chapter also includes a summary of other alternatives considered but eliminated from detailed analysis, a comparative impact analysis summary of the project alternatives, and the BLM’s preferred alternative.

2.2 Existing Facilities and Disturbance

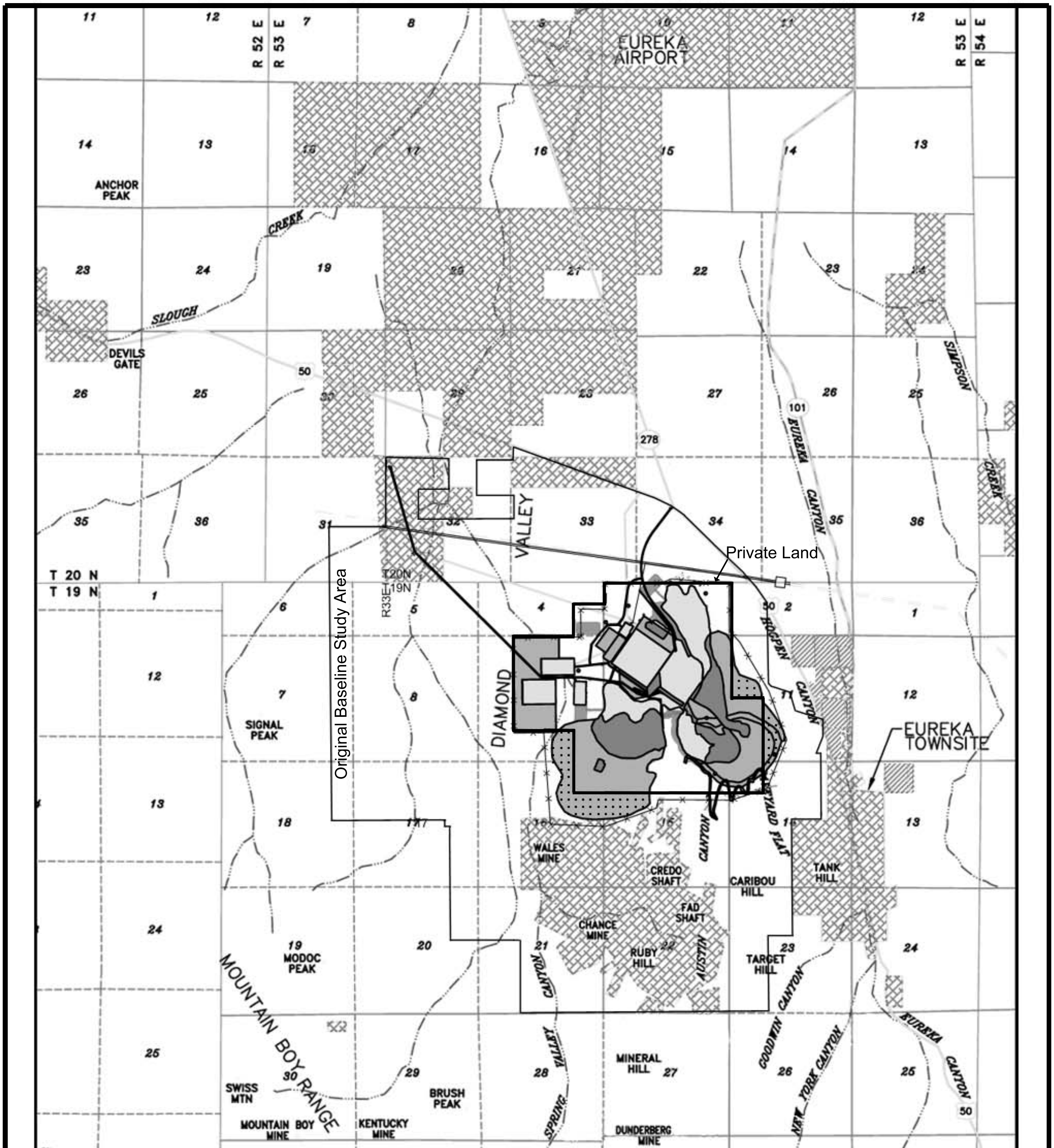
The Eureka Mining District is known for its historic lead, silver, and gold production during the late 1800s. The district produced approximately $60 million in gold and silver and approximately 225 thousand tons of lead between 1869 and 1883. The district also is considered to be the birthplace of American silver and lead smelting technology. Sixteen lead furnaces were operating in the town of Eureka by 1879 with a smelting capacity of 925 tons per day.

The Ruby Hill Mining Company acquired the mining claims in the project area in 1960; Homestake purchased these mining claims in 1994. Barrick Gold Corporation (Barrick) acquired Homestake in 2002; Homestake remains a wholly owned subsidiary of Barrick.

In 1995, Homestake submitted a Plan of Operations for the Ruby Hill Project, an open-pit gold mining and processing operation. Following preparation of Draft and Final EISs in 1995-1997, the BLM signed the ROD and Plan of Operations Approval for the Ruby Hill Project on February 3, 1997. The construction, operation, and reclamation of the existing Ruby Hill Project are described in detail in the Final EIS (BLM 1997a). This section of this SEIS summarizes the existing facilities; Section 2.3 of this SEIS describes the use of the existing facilities in the proposed expansion.

Construction of the existing project began in 1997, and operations began in 1998. Mining ceased in October 2002; however, Homestake continues to produce gold and silver from the existing heap leach facilities. Approximately 51 million tons of waste rock and approximately 7 million tons of ore were removed during the operation. The initial Ruby Hill Project involved a permitted surface disturbance of approximately 760 acres, which initially comprised 738 acres of public land administered by the BLM and 22 acres of private land. In 2003, Homestake purchased the title to 1,644 acres of BLM-managed land (BLM 2003a). This land sale encompassed all areas of surface disturbance associated with the initial Ruby Hill Project (**Figure 2-1**).

The existing Ruby Hill Project includes an open pit (West Archimedes); the West and East waste rock disposal areas; a crushing, grinding, and agglomeration facility; a solution processing facility; heap leach facilities; and ancillary facilities including an office building and parking lot, warehouse/shop, fuel storage,



Legend

- Private land
- Public land
- Existing facilities
- Proposed facilities
- Existing and proposed facilities overlap
- Proposed facilities on federal land
- Eureka County land

Note: Land status is based on BLM's Master Title Plats ***and GIS information from Eureka County***.

N W E S

0 1 2 Miles

Ruby Hill Mine Expansion

Figure 2-1

Surface Ownership

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access and haul roads, growth media stockpiles, a soil borrow source, a permitted Class III landfill for mine operations, diversion ditches, solution and event ponds, and power line and water pipeline corridors (**Figure 2-2**). The existing crushing, grinding, and agglomeration facility includes a three-stage crushing system, ball mill, thickener, belt filters, and an agglomeration drum.

During peak production/operation, the project used approximately 15 acre-feet per year of water for domestic uses and approximately 105 acre-feet per year of water for dust control. Consumption of water in the mine process system was approximately 280 acre-feet per year. Water for the mine has been obtained from the Homestake-owned Collingwood Ranch wells northwest of the mine site.

The initial Ruby Hill Project employed approximately 100 workers during operations. Homestake developed 30 housing units (consisting of 6 single-family units, 4 four-family units, and 4 duplexes) and 4 single-family lots in Eureka County for company employees to help minimize impacts to local housing/rental rates.

2.3 Proposed Action

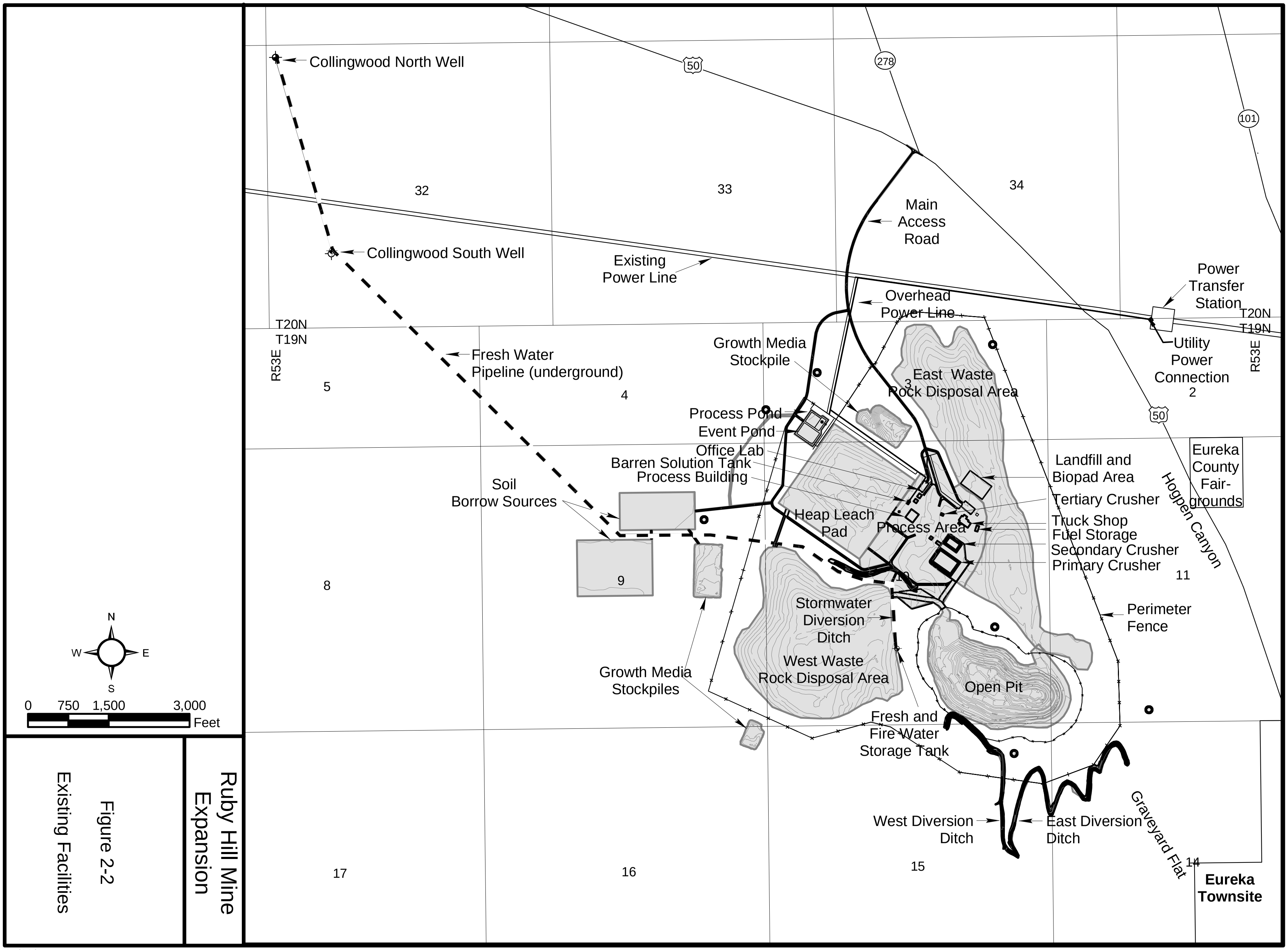
Homestake submitted a Plan of Operations Amendment to the BLM in November 2003 for the proposed Ruby Hill Mine Expansion – East Archimedes Project. The following documents currently provide, or will provide, supplemental information to Homestake's Plan of Operations Amendment:

- Homestake Mining Company – Ruby Hill Land Sale Environmental Assessment (EA) (BLM 2003a); and
- Reclamation Plan (An amendment to the existing plan will be submitted to the BLM and NDEP for approval).

The proposed Ruby Hill Mine Expansion – East Archimedes Project area would be located approximately 0.7 mile northwest of the town of Eureka, in Eureka County, Nevada. The project partially would be located on public land under the jurisdiction of the BLM's Battle Mountain Field Office. Homestake owns the surface of all but approximately 190 acres of the proposed expansion area. Elevations at the site range between 6,200 and 6,500 feet above mean sea level (amsl).

The proposed expansion would result in a total of approximately 744 acres of new surface disturbance. The expansion would include the following principal components:

- Expansion of the open pit and pit activity area
- Expansion of the West and East waste rock disposal areas
- Expansion of the existing heap leach pad
- Dewatering facilities
- New haul road
- New lime silo
- New storm water event pond at the heap leach facility
- Growth media stockpiles
- Realignment of power line segment
- Realignment of access road segment



Ruby Hill Mine Expansion

Figure 2-2

Existing Facilities

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- Expansion of the perimeter fence
- Soil borrow area

The following primary existing facilities would be utilized for the Proposed Action:

- Crushing, grinding, and agglomeration facility
- Adsorption, desorption, and recovery (ADR) plant
- Warehouse/shop
- Administration/laboratory buildings

Figure 2-3 presents the proposed site plan and existing areas of disturbance; **Figure 2-1** shows the land status for the project area. **Table 2-1** summarizes the estimated surface disturbance associated with the proposed expansion.

Table 2-1
Estimated Proposed Surface Disturbance by Facility and Land Status

Facility	Public Surface (acres)	Private Surface (acres)	Total (acres)
Open Pit	13.2	86.7	99.9
Pit Activity Area (pit modification, haul roads, dewatering, etc.)	9.2	29.4	38.6
East Waste Rock Disposal Area	44.5	74.1	118.6
West Waste Rock Disposal Area	123.2	168.1	291.3
Heap Leach Pad/Solution Ponds	0.0	60.7	60.7
Haul Roads with Lime Silo	0.0	4.0	4.0
Utility Route	0.0	1.4	1.4
Growth Media Stockpile	0.0	10.8	10.8
Diversion Channels	0.0	0.0	0.0
Soil Borrow Area	0.0	118.2	118.2
Total	**190.1**	**553.4**	**743.5**

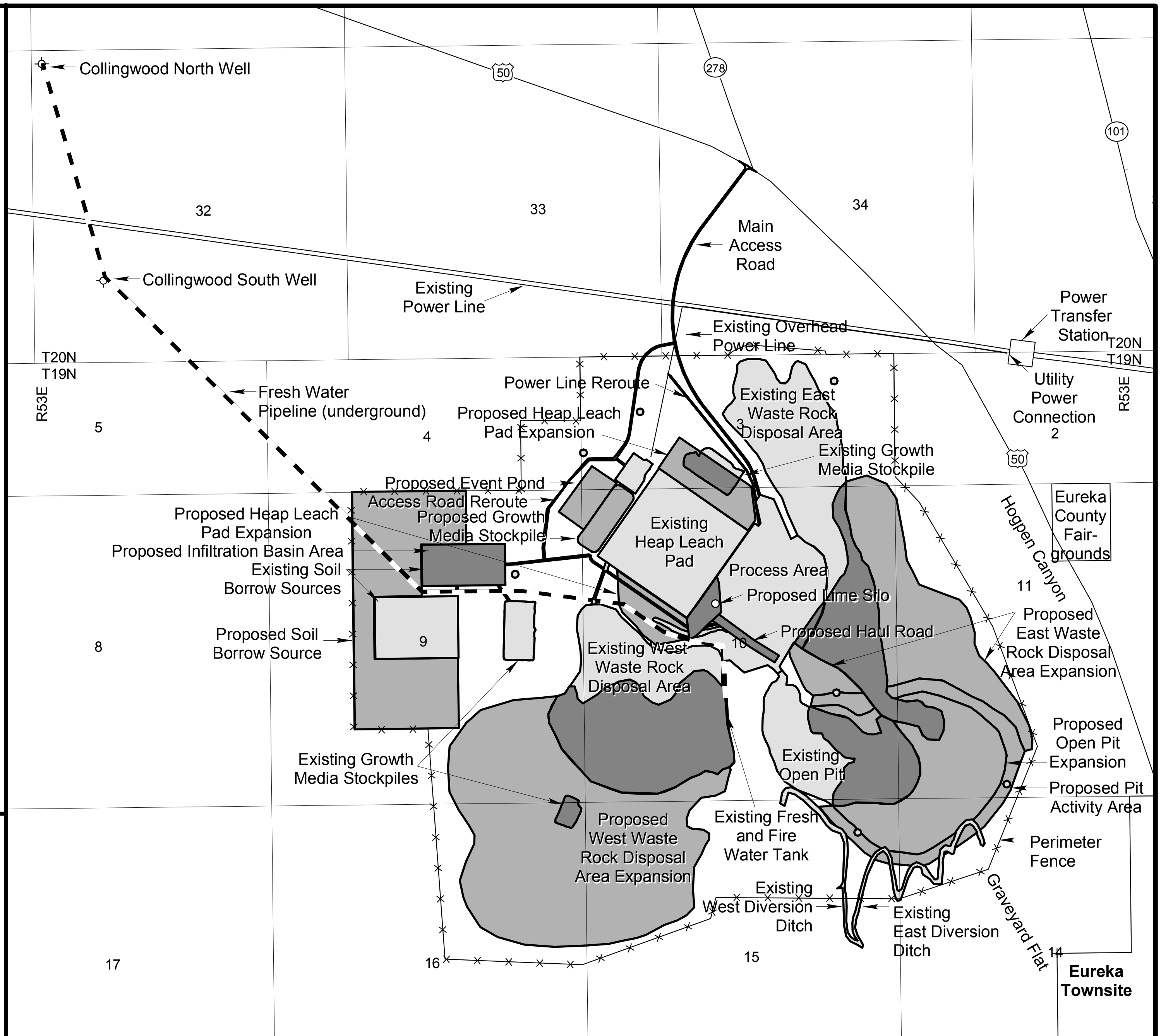
2.3.1 Schedule and Work Force

Homestake proposes to initiate development of the proposed mine expansion in 2005, following issuance of all required permits and approvals. Ore processing and concurrent reclamation would occur from approximately mid-2006 through 2012, followed by an estimated additional 2 years (through 2014) for final reclamation. The construction and operations sequence and schedule would be subject to optimization during final engineering.

Homestake anticipates the need for a construction work force of approximately 20 workers for 4 months to modify the existing ore processing facilities. A maximum of approximately 130 workers would be required for mining and processing operations and concurrent reclamation, and approximately 15 to 20 workers would be needed for the final 2 years of reclamation. It is anticipated that the majority of the work force would be hired from the Eureka area and the surrounding counties. The average annual operations work force payroll is estimated to be approximately $7 million.

Legend:

- Existing facilities
- Proposed facilities
- Existing and proposed facilities overlap



N
W E
S

0 750 1,500 3,000 Feet

Ruby Hill Mine Expansion

Figure 2-3

Proposed Action

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2.3.2 Expansion of Mining Operations

Under the Proposed Action, the existing open pit would be expanded to mine the identified ore reserves. Homestake estimates a resource of approximately 18 million tons of ore in the proposed pit expansion area (known as the East Archimedes Pit) that would be amenable to open-pit gold mining methods and heap leach processing. The ore is anticipated to be 90 percent oxide material and 10 percent sulfide material. It is anticipated that all of the mined ore would be processed at the Ruby Hill Mine site; however, approximately 0.5 million tons of the ore may be shipped off site to Barrick's Goldstrike Mine, located 23 miles northwest of Carlin, Nevada, for processing, depending on the metallurgic conditions of the ore. Approximately 130 million tons of alluvial overburden and 60 million tons of rock overburden also would be removed during mining. The estimated stripping ratio of overburden to ore is approximately 9:1. The waste rock (including both alluvial and rock overburden) is anticipated to be approximately 97 percent oxide material and 3 percent sulfide material.

The removal of ore and waste rock from the East Archimedes Pit would be accomplished using the same conventional open-pit mining methods previously used for development of the existing pit, including drilling, blasting, loading, and hauling. Mining would proceed at an average rate of approximately 100,000 tons per day. The existing stockpile area adjacent to the primary crusher would be used for the Proposed Action. A list of anticipated equipment requirements for the project is presented in **Table 2-2**.

Table 2-2
Anticipated Equipment List

Type of Equipment	Number of Units
Blast Hole Drill	3
Front End Loader	2
Haul Truck (100- to 200-ton)	10
Motor Grader	2
Track Bulldozer	3
Wheel Bulldozer	1
Blasting Agent Bulk Truck	2
Backhoe Excavator	2
Water Truck	3
Hole Stemmer	1
Maintenance Truck	1
Welding Truck	1
Tire Truck	1
Service Truck	1
Flatbed Utility Truck	1
Personnel Carrier	1
Pump	2
Lighting Plant	8
Other Support Equipment and Vehicles	20

2.3.2.1 Open Pit

Development of the East Archimedes Pit (**Figure 2-3**) would involve a layback of the eastern wall of the existing pit and a deepening of the pit by approximately 600 feet. As a result, the East Archimedes Pit would extend approximately 570 feet below the groundwater table, which currently is at an elevation of approximately 5,910 feet amsl. The pit would have an overall depth of approximately 1,100 feet from the pit crest (6,450 feet amsl) to the pit bottom (approximately 5,340 feet amsl). Based on the preliminary pit design, the pit expansion would be mined with 20- to 40-foot benches, with an overall slope angle ranging from 1.3 horizontal (H):1 vertical (V) to 0.6H:1V. A general cross-section of the proposed pit expansion is presented in **Figure 2-4**. Geotechnical investigations would continue, as necessary, to assist in optimizing the final pit design.

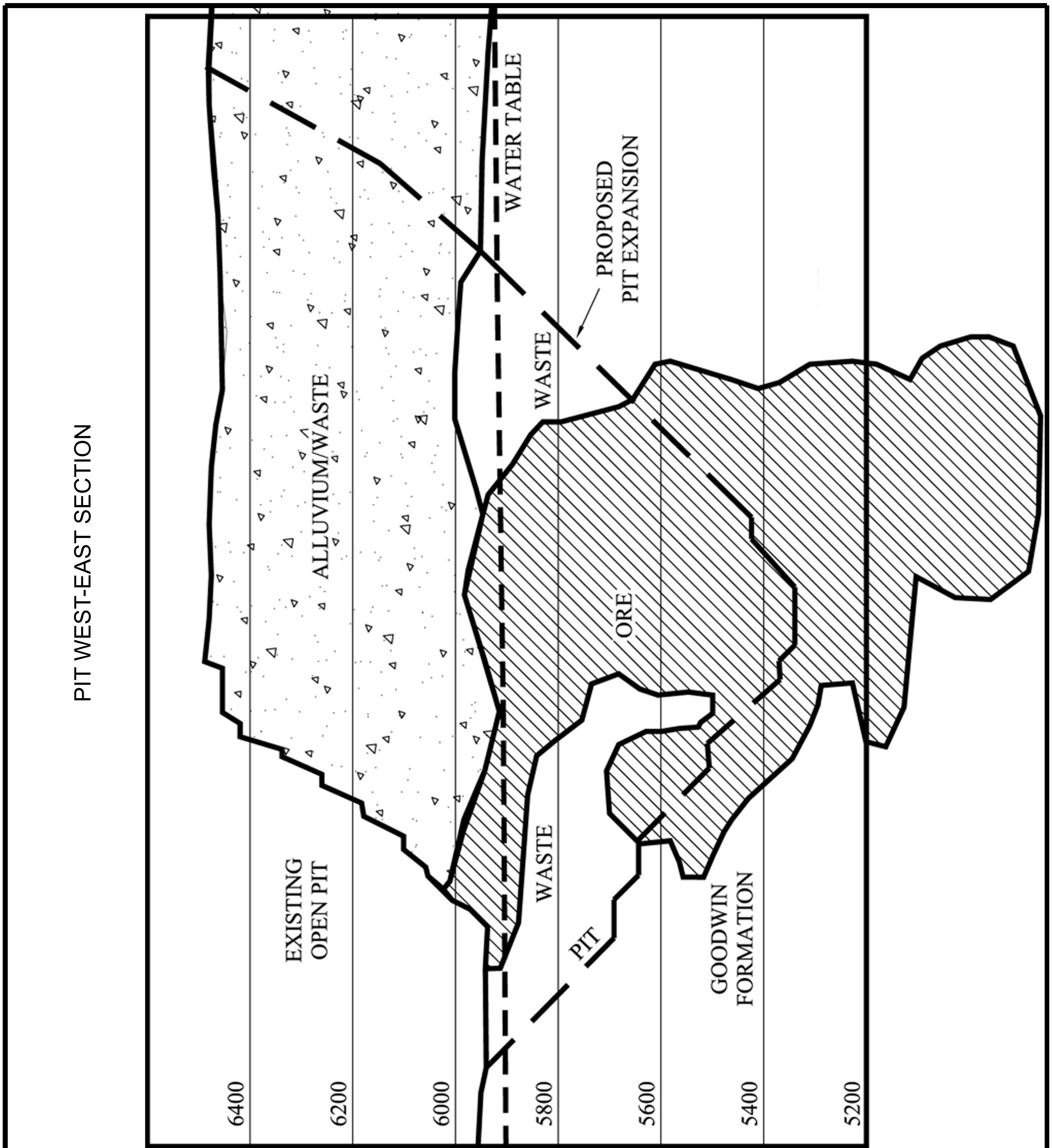
The designated pit activity area shown in **Figure 2-3** would provide operational flexibility for minor pit modifications, haul and access roads, the pit exclusion area (safety berm setback area) and fence, and dewatering facilities. The 200-foot-wide safety berm setback area currently surrounding the existing pit would be modified to also surround the East Archimedes Pit. The safety berm itself would be approximately 30 feet wide and 13 to 14 feet in height and would be built around the outer edge of the setback area. The remaining 170-foot width of the setback area between the safety berm and the pit primarily would provide a buffer zone. No growth media would be salvaged from the safety berm setback area since the area would be minimally disturbed during mine construction and operation. Soils would remain in place to allow natural revegetation of the area with additional seeding, as necessary. ***The East Archimedes Pit would be approximately 1,200 feet closer to the Eureka townsite than the existing pit.***

Pit stability would be monitored throughout the project life to ensure safe uninterrupted operations. Prior to initiation of mining at the existing Ruby Hill Mine, extensive testing on drill core and soils was used to determine the optimum slope angles of the pit walls. This information also has been used in the design of the pit expansion. During operations, routine pit monitoring would consist of:

- Visual inspections at the beginning of each operating shift;
- Mapping and analysis of pit geological features;
- Additional core drilling designed specifically for stability studies, if necessary;
- Documentation and investigation of major failures, if necessary; and
- The installation of permanent survey stations or devices to monitor areas of the pit walls, if necessary.

2.3.2.2 Surface Water Diversions

Runoff currently is directed around the existing pit area and general mine site by a diversion ditch system that was constructed upgradient of these facilities. ***Existing*** water diversion ditch locations are presented in **Figure 2-3**. The existing diversion ditches would be extended or modified, as needed, to continue to direct runoff around the proposed pit expansion area. As per the existing diversion ditches, any new ditches would



200 feet

Ruby Hill Mine Expansion

Figure 2-4

General Pit Cross-section

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be designed and constructed to convey runoff from a 100-year/24-hour storm event in accordance with the requirements of Nevada Administrative Code (NAC) 445A.433.

2.3.2.3 Roads

Access and Haul Roads

A section of the existing access road to the existing solution and storm event ponds would be realigned to accommodate construction of the proposed storm event pond (**Figure 2-3**). The road would be constructed to facilitate drainage. Silt fences, hay bales, or other sediment control devices would be installed, as needed. The existing and realigned access roads internal to the mine site (e.g., access to monitoring sites) and the existing main access road from U.S. Highway 50 to the mine site would be used and maintained for the life of the proposed project (**Figure 2-3**). The main access road from U.S. Highway 50 to the mine site was described in the Ruby Hill Project Final EIS (BLM 1997a). At the request of Nevada Department of Transportation (NDOT), the access road was constructed several hundred feet from the originally proposed location. The current alignment, which intersects U.S. Highway 50 at the intersection of U.S. Highway 50 and State Route (SR) 278 (see **Figure 2-3**), is in accordance with all applicable state highway approach angle and visibility standards.

The existing pit haul roads would be used to access the East Archimedes Pit, thereby reducing the amount of disturbance and waste material removal associated with haul road development for the expanded pit. Existing haul roads between project facilities also would be used for the proposed expansion. A section of new haul road would be constructed to the new lime silo (see **Figure 2-3**). This haul road would be designed to accommodate appropriate mine equipment, including haul trucks, and to meet the U.S. Mine Safety and Health Administration (MSHA) requirements.

Mine waste rock would be used to produce gravel for haul road construction and for maintenance of existing and new haul roads. Sufficient non-acid-generating waste rock (as determined by Homestake geochemical tests) would be available to satisfy all road construction and maintenance needs. If satisfactory pit-run waste rock material is not available, waste rock would be processed on site through the crushing and screening plant to produce an appropriate aggregate.

Snow Removal and Management

Snow removal and management within the operations area would be required to ensure safe winter operation. Drifting snow is expected in some areas, and snow fences may be constructed to control the pattern of drifting. Portions of the primary inner-project service roads and access roads would be cleared using a grader. Proper road maintenance would include the placement of gravel or sand to maintain driving surfaces. Care would be taken to minimize the removal of the road surface during snow removal. Excessive snow from the work areas would be removed by front-end loader and trucks and placed along the perimeter of the same work area. In order to maintain roadway surfaces, dry road surfacing material occasionally would be placed and graded. Storm water and sedimentation controls are described in Section 2.3.14.1, Water Resources, Surface Water Management, and Sediment Control.

2.3.2.4 Drilling and Blasting

Mining of the majority of the waste rock, and all of the ore, would require the use of drilling and blasting techniques. The techniques implemented under the Proposed Action would be the same as previously used during development of the existing open pit. Conventional diesel-powered rotary hammer drills would be used to drill blast holes on a regular spacing pattern that could vary depending on rock hardness and the degree of fracturing. Blast holes would be charged with an ammonium nitrate/fuel oil mixture by means of a truck-mounted mixing/dispensing unit. Where practical, the waste and ore would be blasted separately in order to reduce the amount of ore loss and dilution. Unconsolidated gravels and growth media that do not require the use of drilling and blasting techniques prior to removal would be ripped with a dozer, as needed.

Blasting would be scheduled to minimize noise impacts to community activities and would occur only during daylight hours. Blasting would be designed to control the scattering of rocks (flyrock) that could be a safety hazard for workers. Adequate “stand-off” distance and good blasting practices would be incorporated into the blasting design.

2.3.2.5 Loading and Hauling

Broken ore and waste rock material would be removed from the East Archimedes Pit and transported along haul roads to the existing ore stockpile area or the proposed waste rock expansion areas, as appropriate. Conventional equipment (e.g., front-end loaders and haul trucks) would be used to excavate and haul the ore and waste rock.

2.3.3 Dewatering and Water Disposal

As the East Archimedes Pit would extend into the existing groundwater table during active mining, dewatering wells and possibly pit-floor sumps would be used to dewater the pit and facilitate mining. Portable pumping equipment would be used to pump accumulated water from the sumps. Water from dewatering operations would be used as make-up water for site operations, reclamation, or used as a roadway dust suppressant. Dewatering rates in excess of the project’s projected consumption rate (approximately 650 acre-feet per year) would be returned to the local aquifer via an infiltration basin or reinjection at the Homestake-owned Collingwood wells. Dewatering rates are anticipated to range from 500 to 1,000 gallons per minute (gpm). The volume of dewatering water in excess of operational demand would vary seasonally. Operational water demand for makeup water, dust control, and reclamation would be highest during the spring, summer, and fall, with a correspondingly lower volume of excess water. Conversely, the excess dewatering water volume would be highest (up to 700 gpm) during the winter months when the demand for operational water usage would be lower.

Analyses of groundwater samples collected during dewatering tests indicate that the water quality is within Nevada drinking water standards and is typical of documented background levels from groundwater monitoring wells around the mine site (Water Management Consultants [WMC] 2004).

As stated above, excess dewatering water would be reinjected and/or placed in an infiltration basin. The Homestake-owned Collingwood wells located northwest of the mine site (**Figure 2-3**) would be used both to provide fresh water for the operation as described in Section 2.3.8, Water Supply, and for water reinjection purposes. Groundwater from mine dewatering activities would be pumped from the pit to the existing fresh water storage tank located southeast of the process facility on Mineral Point. Water in excess of operational needs subsequently would be pumped or gravity fed from the tank to the existing Collingwood wells via the existing fresh water line. Based on existing well conditions and both historical and current pumping rates, it is projected that the existing well infrastructure could accommodate up to 1,600 gpm for reinjection purposes.

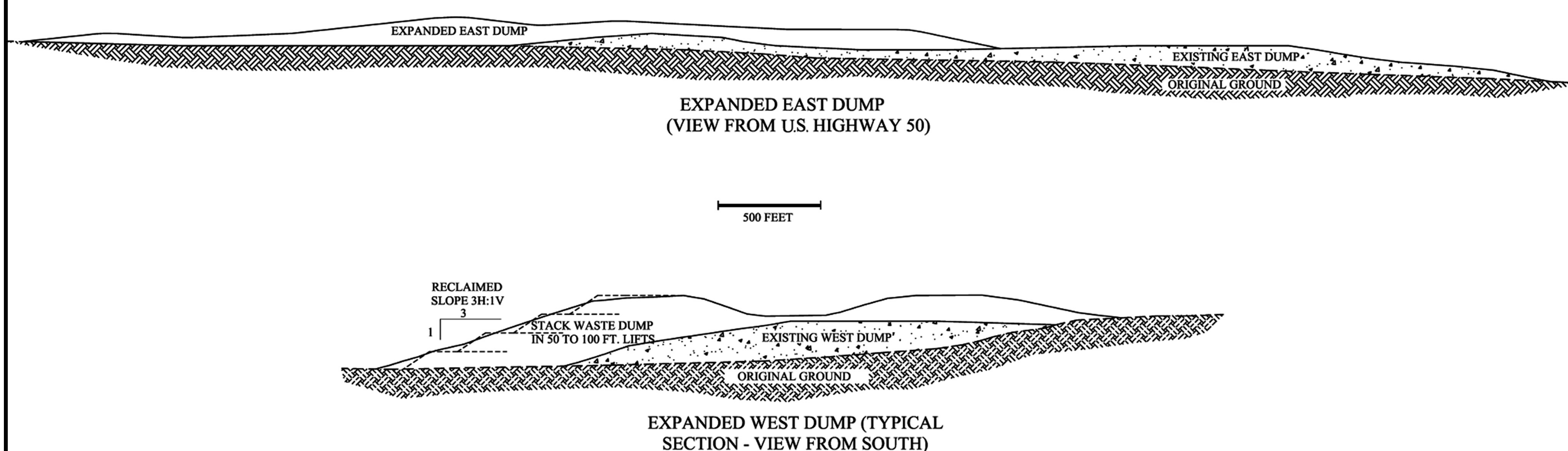
Alternately, dewatering water rates in excess of operational consumption rates would be returned to the aquifer via a rapid infiltration basin. The infiltration basin would consist of one approximately 1.5-acre primary pond with a capacity of approximately 9 acre-feet and a 2-acre overflow pond with an approximate capacity of 10 acre-feet. The ponds would be located in the existing, northernmost, 22-acre soil borrow area located on the west side of the mine site (**Figure 2-3**). Water in excess of operational needs would be pumped from the pit to the infiltration basin via an aboveground water pipeline. Based on the results from five infiltration test pits in the existing soil borrow area, the proposed location is composed primarily of coarse material with infiltration rates consistent with alluvium characteristics. Observed infiltration rates in the test pits indicate that the infiltration basin could accommodate up to 950 gpm per pond acre for water infiltration purposes (Homestake 2005).

Prior to initiation of the project, the required state permits would be obtained for both the proposed reinjection and rapid infiltration basin facilities.

2.3.4 Expansion of Waste Rock Disposal Areas

Under the Proposed Action, the area (**Table 2-1** and **Figure 2-3**) and height of the existing West and East waste rock disposal areas would be increased to accommodate the waste rock from the expanded pit. The height of the East Waste Rock Disposal Area would increase a maximum of 60 feet. The height of the West Waste Rock Disposal Area would increase a maximum of 240 feet. A typical cross-section of the waste rock disposal areas is presented in **Figure 2-5**. Total production of waste rock currently is estimated at approximately 190 million tons, of which approximately 26 million tons would be placed in the expanded East Waste Rock Disposal Area and approximately 164 million tons would be placed in the expanded West Waste Rock Disposal Area.

The waste rock expansions would be engineered, constructed, and reclaimed in the same manner as the existing portions of the disposal areas to ensure long-term stability, provide for practical and effective reclamation, and reduce the overall visual impact. To address local concerns, the waste rock disposal areas have been designed not to affect views of the skyline. As with the existing East Waste Rock Disposal Area, the expanded East Waste Rock Disposal Area would serve the dual purpose of overburden storage and an aesthetic visual barrier between U.S. Highway 50 and the project. Mine waste rock would be hauled from the open pit to one of the two waste rock expansion areas and placed in approximately 50-foot lifts. Two slightly different construction methods would be used depending on the visual sensitivity of the particular disposal area face. Visually sensitive areas occurring on the north and east sides of the waste rock disposal areas. Reclamation in these areas would be completed as soon as possible after sections of the waste rock disposal area faces have been constructed. The waste rock disposal facilities faces would be regraded to an



Ruby Hill Mine Expansion

Figure 2-5

Waste Rock Disposal Area
Typical Cross-section

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overall slope of approximately 3H:1V once enough material has been placed to safely operate equipment. This simultaneous regrading would produce a minimal dump face, usually less than several hundred feet. Less visually sensitive areas are expected to occur on the south and west sides of the waste rock disposal areas. Waste rock disposal area faces located in these areas would be reclaimed concurrently with operations, although typically not as soon as dump faces located in visually sensitive areas. Due to regional climate and growing seasons, concurrent reclamation generally would occur annually instead of simultaneously. The size of the materials that would be placed in the waste rock disposal areas would be affected by the blasting practices and the material handling characteristics. Sulfide waste rock, which would comprise approximately 3 percent of the waste, would be placed in the waste rock disposal areas concurrently with oxide waste rock as it is removed from the pit. Waste rock placement would be planned so that sulfide waste rock would not be exposed on the final surface of the reclaimed facility. This would be accomplished by maintaining multiple dumping locations that would allow sulfide waste rock to be preferentially routed to the interior of the waste rock disposal facility. If minor amounts of sulfide waste rock were exposed in the final sloped surface, the exposed material would be covered with a minimum of 2 feet of growth media.

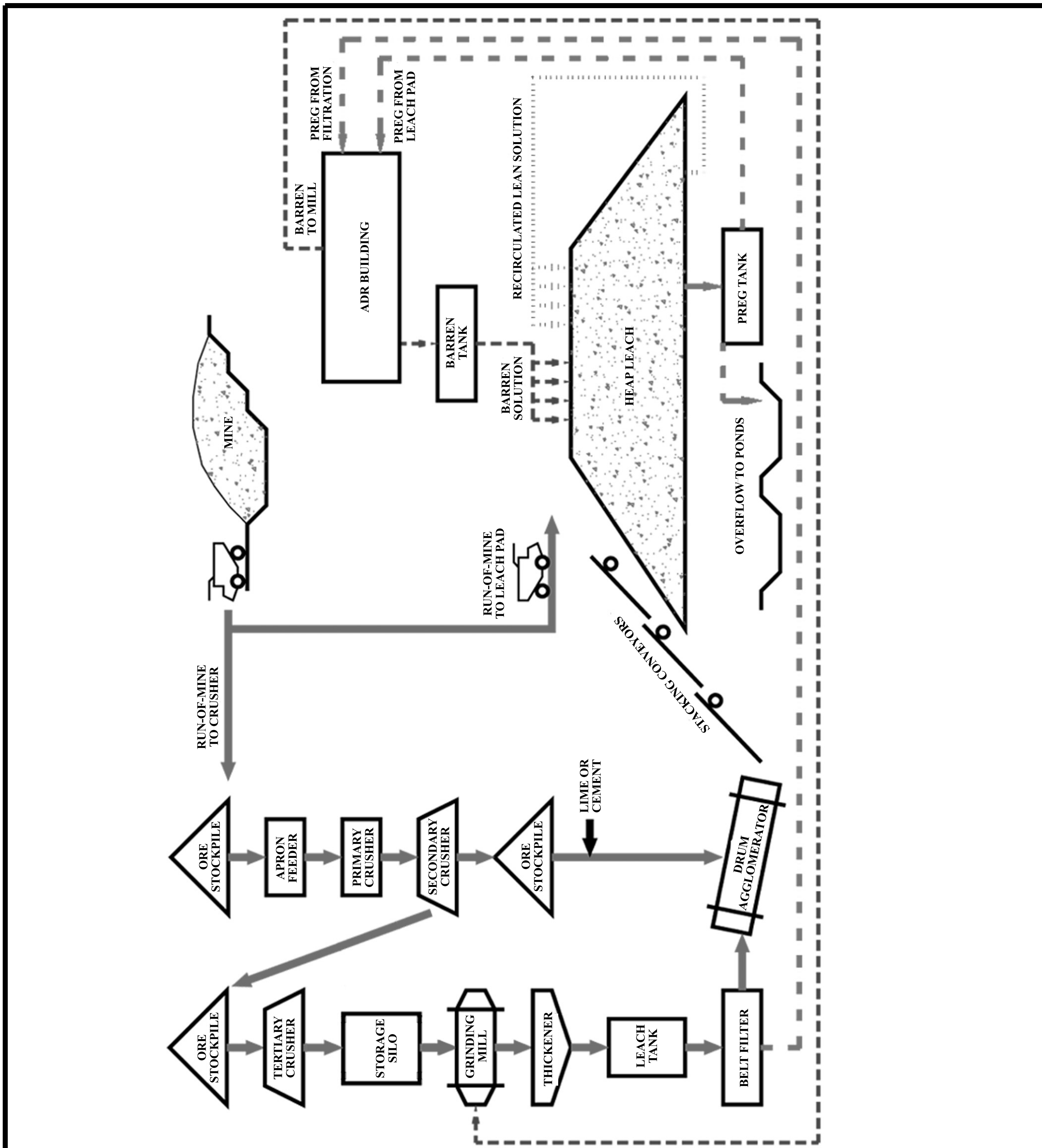
Waste rock mined under the Proposed Action would have the same physical characteristics as the waste rock material in the existing facilities. Based on the strength of the waste rock materials and performance of the existing waste rock disposal areas, stability problems are not anticipated, even with the operational slopes between benches constructed at the angle of repose. The final overall slope configurations would be 3H:1V or shallower.

2.3.5 Existing Crushing and Grinding Facilities

Ore from the proposed expansion that is processed on site would be managed according to grade and metallurgy. Uncrushed ore would be placed directly on the leach pad using trucks from the mine; crushed ore would be transported by conveyor from the crushing system to the leach pad. Mill grade ore would be processed in the existing grinding, leaching, filtering, and agglomeration facility located within the existing process area or transported off site for processing at the existing Goldstrike Mine Mill facility. Existing components at the facility include a three-stage crushing system (primary jaw crusher and secondary and tertiary cone crushers), a ball mill, thickener, belt filters, conveyor system, and an agglomeration drum as described in the Ruby Hill Project Final EIS (BLM 1997a) (see **Figure 2-6**). Their use in the Proposed Action is summarized below.

Ore crushed in the existing primary and secondary crushers would achieve a nominal 1-inch size; the ore then would be stacked by conveyor after receiving lime for pH control, if necessary. Mill-grade ore also would be crushed in the primary and secondary crushers to a nominal 1-inch size, then reduced to an approximate 0.25-inch size in the existing tertiary crusher. The mill-grade ore then would be ground in a ball mill to a nominal -100 mesh size (0.005-inch). Barren cyanide solution would be added to the ore in the ball mill. The slurry discharge from the ball mill would report to the leach tank and thickener, where it would be thickened and routed to a filter system to remove excess solution.

The resulting leached ore filtercake, or pulp, would be transferred to the agglomeration drum, where it would be combined with typically lower-grade ore coming from the secondary crusher at a nominal ratio of 3 to



Ruby Hill Mine Expansion

Figure 2-6

Simplified Process Flow Sheet

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4 tons of lower-grade crushed ore to 1 ton of mill-grade pulp. Cement, at an approximate rate of 10 pounds per ton of ore, would be added to bind (agglomerate) finely ground mill-grade pulp particles to coarser low-grade ore pieces. Barren cyanide solution may be added to the ore mixture in the agglomerating drum, if necessary, to control moisture content of the final ore product. The existing grinding and agglomeration components that utilize cyanide solutions were designed and constructed with containment structures that meet the requirements of NAC 445A.436.

Mill-grade sulfide ore that metallurgically is more amenable to autoclave processing would be shipped to and processed at Barrick's existing Goldstrike Mine mill facility. Use of this mill would result in higher recovery rates. The projected potential shipping volumes and rates are presented in **Table 2-3**. The ore would be trucked north/northeast to Carlin with over-the-road trucks via SR 278 and north/northwest via SR 766 to the Goldstrike Mine.

Table 2-3
Sulfide Ore Shipments

Shipments	Year							
	2005	2006	2007	2008	2009	2010	2011	2012
Sulfide ore (tons)	-	-	7,300	-	3,650	14,600	67,525	209,845
Total number of shipments	-	-	183	0	91	365	1,688	5,246
Number of months shipping	-	-	6	-	3	12	12	12
Number of shipments per month	-	-	30	-	30	30	141	437
Shipments per day	-	-	1	-	1	1	5	14

Note: Assumes 40 tons of ore per shipment.

The existing ore stacking and conveyor system would be lengthened due to the increased distance from the crushing and grinding facilities to the expanded leach pad area. Crushed ore and agglomerated ore would be delivered from the crushing, grinding, and agglomeration circuit to the leach pad via a series of portable bridge conveyors. All conveyors transporting material containing cyanide would be placed on a liner. A radial arm stacker would be used to place the conveyed ore on the pad in lifts that would range in height from 20 feet to 30 feet.

2.3.6 Expansion of Heap Leach Facilities

As described in Section 2.2, Existing Facilities and Disturbance, Homestake is continuing to leach and recover gold and silver from the ore previously loaded on the existing heap leach facility, and this will continue to completion. Under the Proposed Action, the existing heap leach facilities would be expanded to facilitate the processing of ore that would be mined from the East Archimedes Pit (**Figure 2-3**). A simplified schematic of this circuit is presented in **Figure 2-6**. The components of the heap leach facility are identified below:

- Conveyor stacking system;
- Geomembrane/composite-lined process and event ponds;
- Solution application system;
- Solution collection system placed above the liner system;

- Leak detection/collection systems; and
- High-density polyethylene lean and pregnant solution pipelines and associated containment ditches.

Under the Proposed Action, an area of the existing heap leach pad would be increased to accommodate additional ore (**Table 2-1** and **Figure 2-3**). The nominal design height of the leach pad would increase by approximately 40 feet, from 120 feet to 160 feet. A typical cross-section of the heap leach facility is presented in **Figure 2-7**. As a result of the expansion, the design capacity of the facility would increase from the existing 10 million tons of ore to 25 million tons of ore.

2.3.6.1 Heap Leach Design and Construction

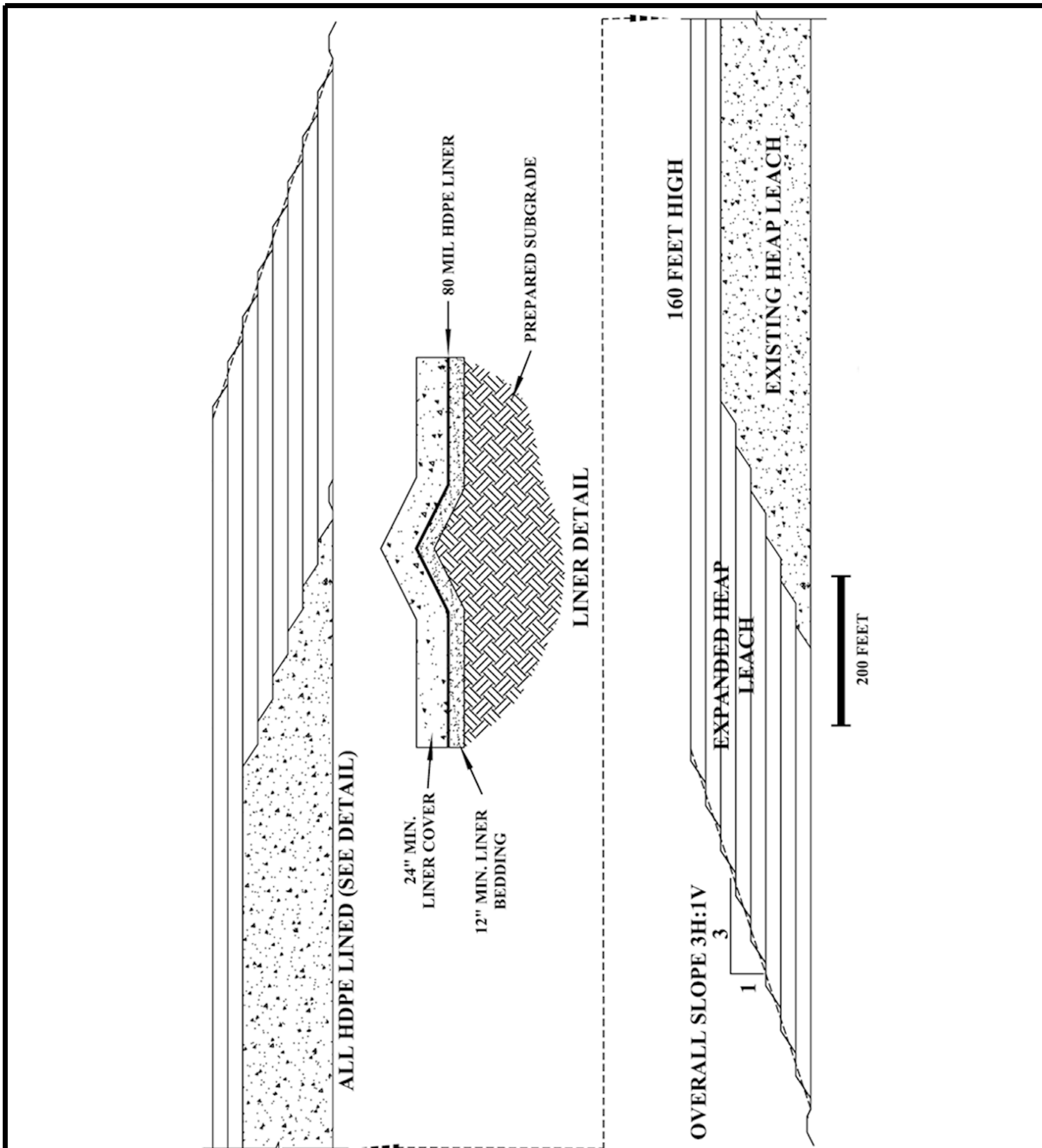
The design and construction criteria for the expanded facility would be consistent with design and construction criteria for the existing heap leach facility. These criteria were described in the Ruby Hill Project Final EIS (BLM 1997a). Specifically, these criteria would pertain to construction of the pad foundation and liner, the solution collection system, additional storm event ponds, and leak detection system. Heap development and operation for the expanded facility, as well as the application of the design and construction criteria for the proposed heap leach expansion, are summarized below.

Prior to construction of the leach pad, the area would be cleared of brush, and the site would be graded and prepared for liner placement. Leach pad site leveling and grading would be performed to control solution flows and establish a stable downhill toe area for the ore heap.

As with the existing Ruby Hill Mine leach pad, the facility expansion would be designed with the capacity to contain all process fluids and meteoric waters generated by a 25-year/24-hour storm event as required by NAC 445A.433). In addition, the system would be designed to continue to provide for containment of a 24-hour draindown resulting from power losses or unscheduled shutdown. Existing perimeter berms and diversion ditches would be extended, where needed, to route storm flows from upgradient catchment areas around the facility into natural drainages below the facility. The expanded diversion system would be designed to continue to safely pass a 100-year/24-hour storm event as required by NAC 445A.433.

The leach pad expansion would be constructed in compliance with NAC 445A.434, and would utilize a composite-lined system with leak detection. The primary liner would be an 80-mil high density polyethylene geomembrane. The liner would be bedded on a minimum thickness of 12 inches of fine-grained soil that would be compacted in place to provide a permeability of less than 1×10^{-5} centimeters per second (cm/sec). The liner bedding would be placed on a compacted subgrade in two 6-inch lifts. Leak detection/collection pipes would be placed beneath the primary liner under areas of concentrated flow. A minimum of 24 inches of crushed sand and gravel would be placed over the synthetic liner to protect it from the heap stacking operation. This material would be free draining to allow solution to pass to the collection pipe system. The liner cover fill would have a maximum particle size of 1-inch and likely would be crushed mine overburden or ore from the East Archimedes Pit.

The heap leach pad expansion areas would be constructed as separate cells from the existing facility and, as with the existing heap leach pad, also would be subdivided into cells of approximately 400,000 square feet to separate flows for concurrent leach cycles. The cells would be separated with 24-inch-high geomembrane lined berms.



Ruby Hill Mine Expansion

Figure 2-7

Expanded Heap Leach Typical Cross-section

07/26/04

Both run-of-mine and crushed/agglomerated ore from the crushing, grinding, and agglomeration circuit would be processed on the leach pad. Run-of-mine ore would be hauled from the mine to the leach pad and stacked directly on the pad with conventional haul trucks. Under the Proposed Action, another silo would be constructed for the addition of lime to haul trucks prior to placement of run-of-mine ore on the leach pad facility (see **Figure 2-3**). This lime would provide pH control for process solutions. Crushed and agglomerated ore from the crushing, grinding, and agglomeration circuit would be transferred and stacked on the leach pad using the modified conveyors (see Section 2.3.5, Existing Crushing and Grinding Facilities).

All ore would be stacked in approximately 20- to 30-foot lifts to a total maximum height of approximately 140 feet above the existing ground level. The stacked heap ore would have overall slopes of approximately 3H:1V. The 3H:1V heap slopes would be constructed either by providing a benched setback of sufficient width at each lift or by regrading the exterior slope during operation. The toe of each successive lift would be set back from the crest of the previous lift to provide a bench for stability considerations during operation of the facility.

Ore would be placed on the heap at an approximate rate of 300,000 tons per month. Once a lift of ore has been loaded, the solution application system would be installed and leaching would commence. Ore typically would be leached in a single 30-day cycle (no rest period) on average using maximum leach solution application rates of 0.0025 to 0.005 gallon per minute per square foot (gpm/ft^2).

2.3.6.2 Solution Collection System

As with the current design, leach solution would be collected on top of the liner by a system of 4-inch perforated collection pipes placed in the liner cover fill. These 4-inch pipes would discharge into progressively larger 8-inch, 10-inch, and 12-inch collection pipes typically placed against the peripheral berms of each cell, which are then routed to the pregnant solution tank and pond. Flow not collected by the 4-inch pipes would discharge into a 10-inch collection pipe placed against the lower berm of each cell of the leach pad, which also would be routed to the solution tank and pond. The leachate collection system is designed to minimize the fluid head on the liner, resulting in a nominal 50-foot spacing of 4-inch perforated solution pipes. For pipe sizing and spacing calculations, the maximum normal solution application rate of approximately 2,200 gpm was used.

2.3.6.3 Leach Pad Leak Detection/Collection System

As with the existing heap leach pad, the leach pad expansion has been designed with a leak detection/collection system placed under the primary liner beneath the 10-inch solution collection pipes in each cell of the leach pad expansion. These pipes are located in areas that would experience the highest solution flows on the leach pad. Leak detection for the leach pad would include separate monitoring systems, one for each cell of the leach pad. In addition, each cell would be separated into three individual leak detection zones to more precisely monitor the facilities.

The leak detection/collection system would consist of 2-inch diameter perforated polyvinyl chloride pipes placed under the geomembrane liner adjacent to the northern cell berms and sub-cell division locations. The perforated polyvinyl chloride pipes would transition to 2-inch diameter non-perforated polyvinyl chloride leak detection pipes at the lowest point of their respective sub-cells. The 2-inch diameter non-perforated polyvinyl chloride leak detection pipes (three total per cell) would drain by gravity to the lowest point of each cell, where they would enter the solution collection channel by booting through the liner in the channel so they could be visually monitored. This would be the only location where the pad leak detection/collection system would pass through the geomembrane liner.

2.3.7 Existing Adsorption, Desorption, and Recovery Plant

The existing ADR plant is located in the same building as the grinding and agglomeration facility (**Figure 2-3**). The solution handling circuit was modified in March 2001 to allow higher total flow rates and recirculation of low-grade (or lean) solution. No changes to the facility or its current operation, which are summarized below, are proposed under the Proposed Action. **Figure 2-6** presents a simplified schematic of this circuit.

2.3.7.1 Solution Processing

Under the Proposed Action, the ADR plant would continue processing gold-bearing pregnant solution at the nominal rate of 1,000 gpm from the grinding circuit and 1,000 gpm from the heap leach circuit.

Pregnant solution from the grinding, thickening, and filtering process would be pumped to a set of five carbon columns, located in the process building, where gold would be extracted from the solution. Grinding circuit column barren solution would report to the mill water tank for re-use in the grinding circuit. Pregnant heap leach solution would gravity drain from the leach pad to a 500,000-gallon pregnant solution tank. This pregnant solution would be pumped to a separate set of five carbon columns, also located in the process building, where gold would be extracted from solution. Heap leach circuit column barren solution would gravity drain to a 500,000-gallon barren solution tank for re-use in the heap leach circuit.

The existing heap leach solution tanks and the process plant were constructed with secondary containment that drains by gravity to the process solution overflow pond through a pipe contained within the lined solution channel on the northern edge of the heap leach pad. The solution pond was sized and constructed to have a minimum operating depth of 4 feet (675,000 gallons), and a total volume equal to 24 hours of draindown from the tanks or plant at 1,000 gpm (1.46 million gallons). In addition, the solution pond would be no more than 12 feet deep, which would include 2 feet of freeboard (623,000 gallons). The pond would continue to be netted, and a pump would be used to remove solution from the pond. An on site generator would provide back-up power in the event of a power outage. The existing event pond was constructed adjacent to the solution pond to contain 110 percent of the largest process tank (550,000 gallons) and flow from a 25-year/24-hour storm event falling on the pad, lined ditches, process pad, and ponds (3.89 million gallons). The event pond would not have a normal or minimum operating depth, but would be operated with 2 feet of lined freeboard (1.2 million gallons). The newly proposed event pond would be constructed to contain flow from a 25-year/24-hour storm event falling on the pad expansion area (approximately 5.5 million gallons).

Cyanide solution from the heap leach barren solution tank would be pumped to a leach pad header pipe with both carbon steel and high-density polyethylene sections. Branch lines from the main header would distribute the solution to emitters located on top of the heap on approximate 2-foot centers. Barren solution also may be applied to the heap by conventional sprinkler heads. Emitters or sprinklers would be assembled and operated to distribute solution at typical application rates of 0.0025 to 0.005 gpm/ft^2.

The entire fluid management system would have a negative water balance, with evaporation and available permanent moisture storage in the ore exceeding precipitation levels. As a result, fresh make-up water would be added to the system, as needed. Sodium cyanide typically would be added to the heap leach barren tank solution and the grinding circuit.

2.3.7.2 Acid Wash Circuit

The loaded carbon would be pumped into an existing 3-ton carbon capacity acid wash tank located in the process building. The loaded carbon then would be washed to remove scale by pumping a weak nitric acid solution through the loaded carbon bed. The pH would be monitored and controlled during the acid wash. After several hours of acid wash, the acid solution would be neutralized with caustic solution or fresh water, and the neutralized solution would be pumped to the heap leach barren tank. The acid-washed carbon would be pumped to the strip vessel.

2.3.7.3 Carbon Stripping and Reactivation

The existing strip vessel, located in the process building, has the capacity to hold 3 tons of loaded carbon. Once excess water has been drained from the vessel, barren strip solution, containing sodium hydroxide and sodium cyanide, would be heated under pressure and pumped up through the vessel. The pregnant solution leaving the strip vessel would flow to the pregnant solution tank. Sodium hydroxide, sodium cyanide, and softened water would be added, as needed, in the barren strip solution tank to maintain proper strip solution composition.

The stripped carbon would be pumped from the strip vessel to a dewatering screen located above the reactivation furnace hopper in the process building. The carbon would be thermally reactivated at approximately 1,200 degrees Fahrenheit (°F) in a horizontal carbon reactivation kiln. Emissions from the kiln would be in accordance with the Nevada Bureau of Air Quality permit criteria. The reactivated carbon would be water quenched and pumped to a dewatering screen located over the reactivated carbon hopper. Fresh carbon would be conditioned in an agitated tank and pumped to the reactivated carbon hopper. Carbon from the reactivated carbon hopper would be added to the carbon columns, as required.

2.3.7.4 Electrowinning

The hot pregnant strip solution would be pumped to the two existing electrowinning cells, located in the process building, where gold would be plated onto stainless steel cathodes using an electric current. The electrowinning barren solution would be recycled to the barren strip solution tank. Periodically, the loaded stainless steel cathodes would be cleaned in a high pressure fresh water wash circuit to remove the precious metals. The resulting gold sludge would be recovered in a plate and frame filter press. Periodically, the sludge filter press would be cleaned and the sludge refined to produce doré bullion.

2.3.7.5 Refining

The refining of the precious metals sludge would be performed on site in the existing electric induction furnace located in the process building. The precipitate would be fluxed and refined to produce doré bullion. The high-grade slag would be recycled in subsequent refining charges, and the low-grade slag would be recycled back to the grinding circuit or potentially shipped off site for final metals recovery.

2.3.7.6 Solution and Storm-event Storage Ponds

In accordance with NAC 445A.435(1), the existing process solution overflow pond previously was constructed with primary and secondary synthetic liners (80-mil and 60-mil high density polyethylene, respectively) with a high density polyethylene drainage geonet placed between the two liners to act as a leak detection/collection system. As allowed by NAC 445A.435(3), the existing storm event pond was constructed with a single high density (60-mil) polyethylene liner without leak detection. The additional storm event pond also would be constructed with a single high-density (60-mil) polyethylene liner without leak detection.

The process solution overflow pond would continue to be netted to deter access by birds and other wildlife. Homestake may elect to utilize other methods of excluding wildlife from the pond; these methods would be coordinated with the BLM and NDOW.

2.3.7.7 Process Solution Overflow Pond Leak Detection

The process solution overflow pond was designed and constructed with a high-density polyethylene geonet leak detection layer constructed between the primary and secondary liner. In the event of a leak in the primary liner, the solution would be collected in the leak detection/collection layer and transported by gravity to a sump in one corner of the pond. The sump contains a 1-foot-thick layer of free-draining sand and gravel. A 4-inch diameter pipe extends from the base of the sump to a high density polyethylene leak detection manhole constructed adjacent to the pond, where the presence of fluids may be visually checked, sampled, or measured on a regular basis. The portion of the pipe constructed in the pond sump was perforated to allow fluids to drain from the sand and gravel into the pipe.

In the event of a major leak within the solution pond's primary liner, a pump may be used to evacuate the collected fluids from the 3-foot diameter manhole and pump the fluids to the existing process pond, as required by the existing water pollution control permit. The base of the manhole extends 2 feet below the invert elevation of the inlet pipe, providing for a sump capacity of approximately 106 gallons. The high-density polyethylene manhole has welded seams to provide watertight containment to the ground surface in the case of a major leak in the primary pond liner.

2.3.8 Water Supply

Fresh water would be required for drinking, fire fighting, process operations, dust control/reclamation, and general utility uses. Water would be obtained from dewatering wells located on site. If necessary (due to lower than projected dewatering rates), water needed for site operations could be obtained from one or more of the existing water wells located on the Homestake-owned Collingwood Ranch. Homestake has water rights associated with the Collingwood Ranch totaling approximately 1,100 acre-feet of consumption per year. The locations of the existing water wells and water line are shown in **Figure 2-3**. Fresh water storage tanks previously installed near the wellfield and southeast of the process facility on Mineral Point would be used during construction and operation of the proposed expansion project. The tank on Mineral Point holds up to 250,000 gallons. The tanks would provide water for site needs and to maintain a fire water reserve. Potable water would be supplied by a bottled-water vendor or a Homestake water well in accordance with applicable Nevada Bureau of Health Protection Services standards. **Table 2-4** presents the estimated water consumption for the proposed expansion.

Table 2-4
Water Consumption Estimates

Use	Quantity (acre-feet per year)
Process	350
Domestic	15
Dust Control/Reclamation	300
Total	**665**

2.3.9 Electric Power

The Mount Wheeler Power Company would provide power for the proposed expansion project via the existing overhead power line and substation that were constructed for the existing Ruby Hill Project. Approximately 0.1 mile of the power line would be relocated to a new utility ROW on private land to accommodate the leach pad expansion (see **Figure 2-3**). Diesel generators previously installed for the existing Ruby Hill Project would provide emergency power, as required.

2.3.10 Ancillary Facilities

Existing ancillary facilities at the mine site (see **Figure 2-2**) would continue to be used during construction, operation, and reclamation of the proposed expansion. These facilities include a warehouse and maintenance facility that would provide for equipment repair, the administration building, a laboratory for chemical and metallurgical testing, and storage buildings. The fuel storage capacity of the existing fuel tank farm would be increased, as necessary, with the addition of aboveground tanks that would be placed in a bermed containment area.

The sanitary waste system would consist of a combination of portable and existing permanent facilities. The existing permanent facilities consist of State of Nevada-approved, engineered leach field systems. Portable facilities would consist of chemical toilets that may be moved to various locations as operations dictate. Wastes from the portable toilets would be disposed of according to state and local requirements.

2.3.11 Security and Fencing

Security in the project area would be the responsibility of Homestake. The security system would include direct security measures, supported by employees involved in the day-to-day operation. Persons entering and leaving the area would be required to gain clearance through a secured gate located near the administration building along the main access road.

The range control perimeter fence (4-strand with 3 strands barbwire and a smooth bottom strand) around the existing facilities would be extended to encompass the facility expansions (**Figure 2-3**). An 8-foot chain-link fence would be installed around the newly proposed storm event pond to prevent access by wildlife and livestock. The 8-foot chain-link security fences around the existing pit would be extended to encompass the pit expansion area, following the completion of mining. Any monitoring wells located outside the fenced area would be clearly marked and locked. Additional fences or controls would be installed, as necessary.

2.3.12 Fire Protection

Fire protection would be a high priority of the operation at all times. All employees would be briefed on the fire protection program at the project as part of job training. Specific measures anticipated to be included in the project for fire protection include:

- Process operations personnel would be on duty 24 hours per day and provide the initial response to fires.
- All mobile equipment would be equipped with fire control equipment including approved mufflers and spark arresters and fire extinguishers.
- Water trucks equipped with water monitors and hose reels would be maintained for fire protection needs.
- The office, warehouse, shop, laboratory, and process buildings currently are, and would continue to be, equipped with a fire water system including a fire water tank and hydrants at appropriate locations.
- Fire extinguishers, shovels, and other control equipment would be located at convenient and readily visible caches throughout the project area.
- Fire hydrants, hoses, and emergency supplies would be strategically located around the mine.
- Homestake's Safety Coordinator, or his designee, would serve as the Fire Control Coordinator.
- Homestake's Fire Control Coordinator would coordinate with the Eureka Volunteer Fire Department.
- Homestake would contact the BLM in the event of any fire.

Phone numbers for the Central Nevada Interagency Dispatch Center and Eureka fire station have been provided to Homestake.

2.3.13 Hazardous Materials and Solid Waste

Procedures for reagent transportation and storage, waste management, and the spill prevention and emergency response programs for the initial Ruby Hill Project currently are in place and would be updated to reflect the proposed expansion, as necessary. These procedures, as described in the Ruby Hill Project Final EIS (BLM 1997a) and summarized below, are required by state and federal regulations.

2.3.13.1 Reagent Transportation and Storage

All liquid reagents including sodium cyanide, antiscalant, sodium hydroxide, and nitric acid would be trucked to the site and stored in existing specially designed and constructed containers located within existing concrete and concrete-bermed areas. These bermed areas were designed to contain 110 percent of the capacity of the storage tank or tanks in series within the berm. With the exception of the acid storage area, bermed storage areas were designed to drain into the process solution pond. Solid reagents such as sodium cyanide, pebble lime, cement, flocculent, and caustic soda beads would be trucked to the site and stored in existing flow bins or silos specifically designed for these materials. Lime storage also would be provided by a new lime silo that would be located near the heap leach pad expansion area (see **Figure 2-3**). All reagents would be stored in a manner that would inhibit any inter-mixing and subsequent reactions. Reagent storage and cleanup procedures are presented in the mine's existing Emergency Response and Contingency Plan as summarized in Section 2.3.13.2, Spill Prevention and Emergency Response, of this SEIS. The use and storage of key reagents are summarized in **Table 2-5** of this SEIS and discussed in detail in the Ruby Hill Project Final EIS (BLM 1997a).

Fuel (i.e., gasoline, diesel fuel, and propane), antifreeze, petroleum oils, and solvents would be delivered to the project site in tanker trucks for transfer to existing and proposed additional storage tanks. All storage tanks or tanks in series are or would be enclosed by berms sized to contain 110 percent of the capacity of the largest tank in the event of a spill or tank rupture. Homestake's existing Spill Prevention, Control, and Countermeasure (SPCC) Plan would be implemented in the event of a spill or release of petroleum products.

Explosive materials that would be transported to the site include blasting agents and initiation devices. Blasting agents would be composed primarily of ammonium nitrate and fuel oil. The ammonium nitrate and fuel oil would be stored in appropriate storage bins separate from the explosive magazine. Blasting initiation devices would be stored in the existing prefabricated magazines that were selected and located to conform to federal and state regulations.

2.3.13.2 Spill Prevention and Emergency Response

There are several regulatory frameworks to deal with spill prevention and releases of hazardous substances and petroleum. The Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) creates a framework for planning and response to hazardous substance releases. The part of CERCLA that governs emergency planning is the Emergency Planning and Community Right-to-Know Act (EPCRA)

Table 2-5
Hazardous Materials Summary

Material	Use	Rate of Use	Amount Stored (typical)	Storage Method	Waste Management/ Disposal	Use Location	Primary Hazard Designation	Amount Per Load
Calcium hypochlorite	Spill Clean-up	<1 ton/year	2,000 pounds	Sack	Spent	Process Facility	Oxidizer	2,000 pounds
Nitric acid	Process	8,000 gallons/year	8,300 gallons	Tank	Spent	Process Facility	Corrosive	7 to 10 tons
Hydrochloric acid	Laboratory	10 gallons/year	10 gallons	Bin/Barrel	Spent	Process Facility	Corrosive	5 gallons
Lime (calcium oxide)	Process	6,250 tons/year	90 tons	Silo	Spent	Process Facility	Corrosive	20 to 25 tons
Portland cement	Process	6,250 tons/year	120 tons	Silo	Spent	Process Facility	Corrosive	25 to 40 tons
Sodium cyanide (solid or liquid)	Process	450 tons/year	90 tons	Bin/Tank	Spent	Process Facility	Highly Toxic	20 tons
Sodium hydroxide (solid or liquid)	Process	250 tons/year	50 tons	Bin/Tank	Spent	Process Facility	Corrosive	10 tons
Diesel fuel	Mine	2,800,000 gallons/year	60,000 gallons	Tank	Spent	Truck Shop	Flammable	6,000 gallons
Gasoline	Mine	30,000 gallons/year	10,000 gallons	Tank	Spent	Truck Shop	Flammable	6,000 gallons
Propane	Mine	20,000 gallons/year	10,000 gallons	Tank	Spent	Office, Lab, Truck Shop, Process Facility	Flammable	2,000 gallons
Sodium carbonate	Refinery	5 tons/year	1,000 pounds	Barrel	Spent	Process Facility	Irritant	500 pounds
Sodium borate	Refinery	5 tons/year	1,000 pounds	Barrel	Spent	Process Facility	Irritant	500 pounds
Silican dioxide	Refinery	5 tons/year	500 pounds	Barrel	Spent	Process Facility	Irritant	500 pounds
Petroleum oils	Mine	60,000 gallons/year	17,000 gallons	Tank	Recycled	Truck Shop	Flammable	2,000 gallons
Antifreeze	Mine	1,000 gallons/year	5,000 gallons	Tank	Recycled	Truck Shop	Toxic	500 gallons
Solvents	Mine	100 gallons/year	60 gallons	Barrel	Recycled	Truck Shop	Flammable	30 gallons
Ammonium nitrate	Mine	1,800 tons/year	100 tons	Bin	Spent	Mine	Explosive	20 tons
Class A explosive	Mine	12 tons/year	2 tons	Magazine	Spent	Mine	Explosive	2 tons
Fluxes/reagents	Lab/Refinery	1 ton/year	1,000 pounds	Various	Spent	Laboratory	Toxic	100 pounds
Anionic flocculant	Process	45 tons/year	8,000 pounds	Tank	Spent	Process Facility	Irritant	2,000 pounds

which was part of the Superfund Amendments and Reauthorization Act (SARA). The basis of emergency planning begins with requirements set forth in the Occupational Health and Safety Administration (OSHA) Hazard Communication Standard. Under EPCRA, facilities that are required by the Standard to have material safety data sheets (MSDS) on hand for hazardous chemicals also are subject to certain reporting and planning requirements, dependent on threshold amounts of those chemicals or threshold planning quantities (TPQs). The TPQ for OSHA hazardous chemicals is 10,000 pounds. The TPQs for materials designated as extremely hazardous substances (EHS) is 500 pounds or less, depending on the hazard posed by the particular EHS. Under the reporting requirements set forth in Sections 311 and 312 of SARA Title III, the Proposed Action would be subject to certain reporting and emergency planning requirements, because the amounts of certain hazardous chemicals on site would exceed 10,000 pounds. Some of those materials include portland cement, sodium hydroxide, diesel fuel, gasoline, petroleum-based oil, ethylene glycol, and ammonium nitrate. Also present on site are two EHS present in amounts greater than the TPQ (sodium cyanide, TPQ 100 pounds; and nitric acid, TPQ 1,000 pounds).

Reporting and emergency planning under EPRCA include the following:

- The facility must notify state and local emergency planning committees that the facility is subject to emergency planning requirements.

- The facility must submit to state and local emergency planning committees and local fire departments copies of MSDS or a list of those materials defined as hazardous under the OSHA Hazard Communication Standard that are present in excess of 10,000 pounds or in amounts greater than the TPQ for EHS.

- The facility must submit an annual inventory of such materials stating the maximum amounts of those materials at any given time throughout the calendar year, an estimate of average daily amounts of those materials, and the location of those materials at the facility.

- The annual inventories must be submitted by March 1 for materials at the facility in the prior calendar year.

- All reporting, notification, and other plans supplied to the local, state, or federal authorities under EPCRA are available to the public.

Homestake previously provided information relative to hazardous materials on hand at the existing Ruby Hill Mine to the Eureka Local Emergency Planning Commission, Eureka Volunteer Fire Service (VFS), and Eureka Clinic and Emergency Medical Service. No changes are proposed for the types of materials that would be used on site; quantities would change. Homestake would continue to provide annual inventories to the appropriate agencies including the State Fire Marshal's office.

CERCLA also established reportable quantities for releases of hazardous substances. If a hazardous substance is released in an amount greater than its reportable quantity, then a facility is required to report the release to the National Response Center and to state and local authorities. Examples of reportable quantities for certain chemicals that may be used under the Proposed Action include sodium cyanide

(10 pounds); nitric acid (1,000 pounds); sodium hydroxide (1,000 pounds); and calcium hypochlorite (10 pounds).

The U.S. Department of Transportation (USDOT) has developed a list of materials that are classified as hazardous for transportation purposes (49 CFR 172.101) and prescribes packaging and labeling requirements for each designated hazardous material. The USDOT hazardous materials list includes the hazardous substances regulated under CERCLA, as well as other types of chemicals. The hazardous substances to be used in mining activities under the Proposed Action would be transported to the site in accordance with USDOT and applicable NDOT regulations.

Homestake previously developed an Emergency Response and Contingency Plan for the Ruby Hill Project that would continue to be maintained and implemented, as needed, under the Proposed Action. This plan describes the system that would be used for the prevention, response, containment, and safe cleanup of any spills or discharges of substances that potentially may degrade the environment. Also included are procedures to be followed after a seismic event. The Emergency Response and Contingency Plan that Homestake previously developed includes a fluid management plan that describes the capabilities of the fluid containment systems to accommodate unusual natural or operational events to prevent fluid losses from containment areas. The plan also discusses monitoring capabilities to detect leaks from the leach pad, pipeline leaks, pipeline breaks, or other releases from the fluid management system; and the reporting procedures. The fluid management system includes the process recovery system, piping, pumping, ditches, and other items used in the management and fluid containment of the leaching and processing facilities. The plan also would apply to spills of stored chemicals and petroleum products. The procedures outlined in this plan apply to potential leaks and spills that would remain within the mine boundary or flow off site.

Petroleum products are excluded from regulation as hazardous substances under CERCLA. Standards for the storage and spill prevention of petroleum products are established by regulations issued under the Clean Water Act. These regulations are contained in 40 CFR Part 112. In compliance with Part 112, Homestake developed a SPCC Plan (Welsh Engineering Science and Technology Incorporated [WESTEC] 1997b). The SPCC Plan describes the systems and procedures to prevent and contain spills of petroleum fuels, lubrication oil, and used oil. The plan also identifies the spill discovery, notification, and the general cleanup procedures. The plan would be updated, as necessary, for the Proposed Action.

All chemicals would be stored and handled in accordance with manufacturer's recommendations and state regulations. The MSDS for all the chemicals used on the project site would be kept at locations that are accessible to the working personnel in accordance with the OSHA Hazard Communication Standard.

2.3.13.3 Waste Management

Landfill

Homestake would continue to operate the existing on site Class III landfill to dispose of non-toxic and non-hazardous solid waste. A Class III landfill permit previously was obtained from the NDEP Bureau of Waste Management. To facilitate final closure, Homestake would explore the possibility of utilizing the lined process solution pond or the storm-event ponds as a Class III landfill during closure. Homestake would evaluate these options with the applicable agencies prior to closure.

Equipment Wash Water and Maintenance Shop Wastes

All petroleum-impacted wash water that results from equipment washing activities would continue to be collected in existing concrete sumps that drain the reinforced concrete floor of the existing wash facility. The accumulated sump solution would be pumped through the existing oil/water separator. Water recovered from the separator would continue to be: 1) recycled for wash water, dust control, or process water; 2) allowed to evaporate; or 3) disposed of in accordance with all appropriate federal and state regulations. All oily wastes (oil changes, sump separation, and oil absorbents) would be disposed of in accordance with all appropriate federal and state regulations.

Laboratory Wastes

The existing laboratory facility is equipped to perform daily analyses of pit and process samples, screen analyses, and environmental analyses for solids and liquids. Laboratory wastes would continue to be collected and either recycled in the process circuit or disposed of off site in an approved depository in accordance with all appropriate federal and state regulations.

2.3.14 Applicant-committed Environmental Protection Measures

During construction and operation of the Ruby Hill Mine Expansion – East Archimedes Project, Homestake would implement applicant-committed environmental protection measures to mitigate impacts to air, land, and water resources and to prevent undue or unnecessary degradation of the environment in the project area as part of the expansion project's standard operating procedures. Pre-development planning, pollution prevention measures, and pollution control measures and equipment would be used to reduce potential project-generated environmental impacts.

Proposed environmental protection measures applicable to the proposed mine expansion have been adopted from the Final Plan of Operations, Ruby Hill Project (Homestake 1996a) and the Ruby Hill Project Final EIS (BLM 1997a). Monitoring and mitigation measures applicable to the mine expansion as described in the Ruby Hill Project ROD and Plan of Operations Approval (BLM 1997b) also would be implemented. These measures are summarized below. Additional environmental protection measures and monitoring and mitigation measures that previously were implemented for the Ruby Hill Project (i.e., chain-link fence around solution ponds; tanks for containment of normal process flows; enclosures on crushers, screens, and transfer points; etc.) would remain in place and effective during the life of the proposed expansion project.

2.3.14.1 Water Resources, Surface Water Management, and Sediment Control

- Current erosion control measures are contained in the mine's Storm Water Pollution Prevention Plan (SWPPP) (WESTEC 1997b). These measures include minimizing the area of soil disturbances; implementing concurrent reclamation; and installation of temporary diversion ditches, berms, and settling basins, as required. Similar measures would be implemented during construction, operation, and reclamation of the proposed expansion.

- Storm water diversion systems, as outlined in the SWPPP, would be constructed around new disturbance areas, as needed. Design criteria for any permanent diversions would be based on a

100-year, 24-hour storm event. Appropriate measures would be taken to ensure that the Eureka County waterline and Hogpen Canyon road would not be adversely affected by typical storm water drainage from site diversion systems.

- All existing roads at the Ruby Hill Mine have been constructed and maintained to provide adequate drainage and to minimize damage to soil and water resources. These goals have been met through the installation of ditches, settling basins, and culverts sized to meet applicable standards. These practices would continue during construction and maintenance of new mine expansion-related roads. Measures outlined in the SWPPP (e.g., hay or straw bale barriers and silt fences) and other measures not identified in the SWPPP (e.g., dispersion terraces, gabion sediment traps, or grass filter waterways) would be implemented, as required.

- To confirm potential groundwater drawdown model predictions, Homestake has committed to installing two additional groundwater level monitoring wells adjacent to the mine site, which would be monitored on a quarterly basis in conjunction with other existing wells already in place. It is anticipated that one of the new monitoring wells would be located near the County Fairgrounds and the other would be located near the U.S. Highway 50/SR 278 intersection.

2.3.14.2 Acid Rock Drainage

- Geochemical testing has been conducted on representative samples of waste rock from the pit expansion area to determine the net acid-neutralizing capacity. The results would be verified through implementation of a waste rock and overburden testing program during the operational phase of the expansion, similar to the program that was in place during the previous mining operations. Specific testing procedures for this program are contained in the existing State of Nevada Water Pollution Control Permit for the Ruby Hill Project.

2.3.14.3 Emergency Response and Spill Contingency

- Spill prevention measures and contingency plans for containing accidental spills and for preventing uncontrolled discharges to the environment currently are in place at the project. These measures are outlined in the Emergency Response and Contingency Plan, which includes the SPCC Plan (WESTEC 1997***c***). Implementation of the spill prevention, response, containment, and cleanup measures as outlined in the plan would ensure that, during construction and operation of the mine expansion, spills of fuel or reagents would be contained, collected, and reintroduced into the process stream or safely disposed of in accordance with all appropriate federal and state regulations. The plan also includes procedures to be followed after a seismic event.

2.3.14.4 Stability of Facilities

- Ore and waste rock to be placed, respectively, in the heap leach pad and waste disposal facilities would have the same physical characteristics as the existing material in these facilities. The expansion areas of the waste rock disposal areas and the heap leach pad would be designed and constructed to be stable during operation and following project closure. These designs would be based on the stability modeling results for the existing facilities, which are described in the Final Plan of Operations, Ruby Hill Project (Homestake 1996a). In addition, these facilities would be visually monitored on a regular basis during operation to identify any visible stability problems.

- Geotechnical investigations of the pit would continue throughout operations to assist in optimizing the final pit design. Pit stability has been, and would continue to be, monitored throughout the project life to ensure safe and uninterrupted operation. Monitoring has and would continue to consist of visual inspections, mapping and analysis of pit geological features, pit wall monitoring, documentation and investigation of major failures. If needed during the expansion, additional core drilling for stability studies, or the installation of additional permanent survey stations or devices to monitor pit walls, would be undertaken.

2.3.14.5 Wildlife, Special Status Species, and Livestock Protection

- The rerouted power line segment would be designed and constructed to minimize raptor electrocution potential.

- Anti-perching features would be used on newly constructed power line structures to minimize predation on sage grouse by raptors.

- During construction and operation of the existing Ruby Hill Project, Homestake constructed range fences compliant with BLM standards to exclude livestock from the project area. These fences would be expanded and maintained during the construction, operation, and reclamation of the proposed expansion.

- To minimize bird and bat mortality from open process solutions, the heap leach pregnant, barren, and lean solutions are, and would continue to be, collected in pipes. The two existing process solution tanks and process solution overflow pond currently are netted. The nets would be maintained through operation and closure of the proposed expansion or until no longer required.

- Homestake has monitored, and would continue to monitor, wildlife mortality on the project site and to report all mortalities. As part of this process, the top of the heap leach pad currently is, and would continue to be, monitored daily for any substantial pooling of cyanide solutions. When necessary, appropriate measures to protect wildlife and eliminate pooling have been, and would continue to be, implemented.

- In the event that initiation of the expansion project should occur during the raptor nesting season (March 15 through July 15), a raptor survey***, including, but not limited to, hawks, eagles, and burrowing owls,*** would be conducted, and appropriate mitigation measures, such as buffer zones around occupied nests, would be developed and implemented, as needed.

- To protect nesting birds, removal of migratory bird habitat on currently undisturbed lands in the project area would be avoided to the extent possible between April 15 and July 15. Should removal of habitat be required during this period, Homestake would coordinate with the BLM and NDOW to conduct breeding bird surveys and implement appropriate mitigation, such as buffer zones around occupied nests, as needed.

- Existing bat gates at Bullwhacker openings 1 and 2 protect habitat for bats that may be displaced by future mine closures. These would continue to be maintained to secure habitat for bats utilizing the Bullwhacker and associated workings and as a public safety measure.

- Cupola structures would be constructed at the openings of the main Holly shaft, the remaining Williamsburg shaft, and one of the most stable remaining Bullwhacker shafts. These structures would secure habitat for bats in the project area and protect public safety. All other mine openings in the vicinity of the Bullwhacker, Silver West, Holly, and Williamsburg mines would be closed for safety reasons. Prior to the closure of mine workings that could support bat roosting habitat, chain-link fencing or 1-inch chicken wire would be installed in late summer to early fall (after the maternity season and prior to hibernation) to allow bat egress and discourage bats from reentering the mine shafts or adits.

- Homestake would continue to monitor remaining underground openings and historic mine workings that previously were identified as supporting bats. Monitoring would consist of annual summer surface surveys for 3 consecutive years following the implementation of the bat mitigation measures. Mid-August is the preferred time to conduct surface surveys since adults and juveniles can be identified and recorded. These surveys would document the effectiveness of mitigation measures, and the activity and utilization levels of bats within the project vicinity. Homestake would coordinate the mitigation and monitoring with the BLM, bat biologists, NDOW, and Nevada Division of Minerals, as necessary.

- Six artificial nest structures previously were constructed to mitigate potential impacts to the ferruginous hawk as a result of the previously permitted Ruby Hill Mine. Based on monitoring of the nest structures since 1996, four of the six structures successfully have been used by breeding ferruginous hawks. Homestake may consider moving the two artificial nest structures (ANS 3-1 and ANS 3-2) that have not been used by breeding pairs to evaluate if location was a factor in their non-usage.

2.3.14.6 Vegetation and Invasive and Non-native Species

- Certified weed-free mulch and seed mixtures have been used to reclaim portions of the existing Ruby Hill Project disturbance areas. This practice would continue under the Proposed Action. If noxious weeds become established in project-related disturbance areas, a weed removal or spraying program would be implemented. If herbicides are needed, their selection and use would be in accordance with Diamond Valley Weed District and BLM requirements.

2.3.14.7 Visual Resources

- The existing East Waste Rock Disposal Area was designed as a visual shield between the mine site and U.S. Highway 50. The East Waste Rock Disposal Area expansion also would be designed to visually shield, to the extent possible, the pit expansion from U.S. Highway 50 and the Eureka County Fairgrounds.

- Similar to the existing waste rock facilities, final overall slopes on the expanded waste rock facilities would be 3.0H:1.0V or less, and shaped to blend with the existing topography to the extent possible.

- To reduce the visual impact of the expansion of the waste rock disposal areas, waste rock placement on the top of the dumps would be conducted in a manner that would create an irregular surface, and slopes would be shaped to provide topographical variability.

- Water and dust-inhibiting agents would continue to be used, as needed, to reduce the potential visual effects of fugitive dust during operation. Water also may be used to enhance revegetation success, thereby also reducing visual effects.

- Outdoor night lighting at the mine currently is shielded and directed downward whenever possible. This practice would continue during construction and operation of the proposed expansion.

- The concurrent reclamation program previously implemented at the existing Ruby Hill Mine would continue in accordance with the site's Reclamation Plan, which would be amended, as required, for the mine expansion.

- Following the completion of operations, Homestake may choose to keep structures and buildings on private surface land. If applicable, structures and buildings on public surface land would be removed.

2.3.14.8 Air Quality

- Access and haul roads within the project boundary currently are surfaced with gravel and are, and would continue to be, maintained. New expansion-related roads also would be surfaced with gravel and maintained throughout the life of the proposed expansion.

- Dust control measures, including chemical stabilization, water sprays, and other controls approved by the NDEP Bureau of Air Pollution Control currently are in place to reduce fugitive dust. These measures would remain in place during construction and operation of the proposed expansion.

- Currently, speed restrictions are enforced on project roads to minimize particulate emissions from the roadways. This practice would continue throughout the life of the proposed expansion.

- Inactive disturbance areas of the project site have been, and would continue to be, revegetated throughout the operational phase of the project, rather than deferring reclamation until operations have been completed.

- Ambient particulate concentrations were monitored during the previous operational phase at Ruby Hill. This monitoring would resume during construction and operation of the proposed expansion, in accordance with state permit requirements. Meteorological monitoring also would continue.

2.3.14.9 Cultural Resources

- Section 3.15.1 of this SEIS describes the cultural resource surveys that have been conducted in the project area for the existing Ruby Hill Project and the proposed expansion. Appropriate Class III cultural resource surveys previously have been completed throughout the proposed expansion area. If previously undocumented sites are discovered during construction of the mining facilities, construction would be halted in the area of the discovery, and the BLM Authorized Officer would be contacted to evaluate the find. If the site is eligible to the National Register of Historic Places (NRHP), impacts would be mitigated through an appropriate data recovery program agreed upon in the existing Programmatic Agreement (PA) that was developed by the BLM, Nevada State Historic Preservation Office (SHPO), Advisory Council on Historic Preservation, and Homestake for the existing Ruby Hill Mine. The PA is on file at the BLM Battle Mountain Field Office.

- Homestake currently limits employee access to known cultural resource sites, educates employees as to the significance of cultural resources and their vulnerability, and has implemented a strict management policy prohibiting collection of artifacts from lands within the project boundary. These measures would continue throughout the proposed expansion.

- Site number CrNV-63-6546 would be outside of the perimeter fence and as a result would be avoided by the proposed expansion.

2.3.14.10 Land Use Authorizations and Access

- Prior to disturbing any bench mark, section, or corner monument on public land, Homestake would advise the BLM and describe plans to protect or reference them. Witness Corner Surveys would be provided by Homestake to protect existing monuments as required by state surveying procedures.

- The existing access road, located at the intersection of U.S. Highway 50 and SR 278, would continue to be the access route to the project area. This route minimizes heavy truck and vehicular traffic through the town of Eureka, as most mine deliveries would arrive from the west on U.S. Highway 50 or from the north on SR 278.

- The publicly maintained road that traverses Hogpen Canyon would remain open to the public.

- A chain-link security fence would be installed around the ultimate perimeter of the expanded pit after mining has been completed. A safety berm would be constructed inside the chain-link fence.

2.3.14.11 Vibration Monitoring Program

- Blasting only would be conducted only during daylight hours.

- Previous surveys of numerous buildings in Eureka, noise/vibration studies, and the vibration monitoring program are described in the Final Plan of Operations, Ruby Hill Project (Homestake 1996a) and the Ruby Hill Project Final EIS (BLM 1997a). Vibration monitoring would be reinitiated with implementation of the Proposed Action. If persistent blasting-related vibrations greater than 0.25 inch per second are detected by the vibration monitors in Eureka, Homestake would notify the BLM and review and modify blasting practices immediately to avoid further ground vibration in excess of 0.25 inch per second, as necessary.

2.3.14.12 Noise

- Homestake would continue to cooperate with Eureka County and the Eureka County School District (ECSD) to reduce mine-related noise when noise-sensitive activities are scheduled to take place at the Eureka County Fairgrounds.

- During previous operations, blasting procedures were designed and operated to ensure that threshold noise and vibration levels were not exceeded, and to avoid times of greater sensitivity for potential receptors (generally between 7:00 p.m. and 7:00 a.m.). This practice also would be implemented during construction and operation of the proposed expansion.

2.3.14.13 General

- An advisory group including Homestake representatives, local agencies, and citizens was established in 1997 to address issues of concern to the public related to operation of the existing Ruby Hill Mine. This group remains active and would continue to meet throughout the life of the expansion to discuss and resolve public concerns.

2.3.14.14 Environmental Monitoring Plan

- The goal of the environmental monitoring plan presented in the Final Plan of Operations, Ruby Hill Project (Homestake 1996a) is to ensure that the existing Ruby Hill Project is conducted in a manner that prevents unnecessary and undue degradation of the environment. A key objective of the plan is to protect the beneficial uses of groundwater in the vicinity of the project. This plan currently is in place and would continue to be implemented during the construction and operation of the proposed expansion. The plan outlines routine monitoring of the process fluid management system; periodic monitoring of groundwater, overburden, and waste rock; and revegetation success. Revisions to the plan may be made following the completion of detailed operational designs for the proposed expansion and based on any additional monitoring requirements identified during the NEPA process and other state and federal permit requirements.

2.3.14.15 Employee Environmental Education Plan

- In an attempt to help reduce potential impacts to the environment, Homestake would continue to implement the established employee orientation training in environmental awareness. The objectives of this program are to familiarize employees with state and federal environmental laws specific to the mining operation; the safe use of reagents and chemicals utilized on the property; laws regarding wildlife, hunting, and general environmental concerns; and employee obligations regarding the cultural resources of the project area.

2.3.15 Reclamation

The design and construction of the proposed expansion would facilitate concurrent reclamation during project operations and closure. The intent of the project's existing reclamation program is to restore the project area to a beneficial post-mining land use, prevent undue or unnecessary degradation of the environment, and reclaim disturbed areas such that they are visually and functionally compatible with the surrounding topography. Homestake may choose to retain some facilities for post-mining use. The BLM and NDEP Bureau of Mining Regulation and Reclamation are the primary federal and state agencies with regulations for the reclamation of surface mines in Nevada (43 CFR 3809, Nevada Revised Statutes 519A, and NAC 519A, respectively). These reclamation regulations and results of Homestake's extensive reclamation program were used in the development of the previously approved site-specific Reclamation Plan and Permit Application, Ruby Hill Project (Homestake 1996c) and subsequent revisions of May 1998 and October 2001. Reclamation procedures from the previously approved reclamation plan, as amended, would be implemented under the Proposed Action. The post-mining topography associated with the proposed expansion is shown in **Figure 2-8**.

The reclamation procedures proposed for the Ruby Hill Mine Expansion – East Archimedes Project incorporate four basic components:

- Establishment of stable surface and drainage conditions that are compatible with the surrounding landscape and serve to control erosion;

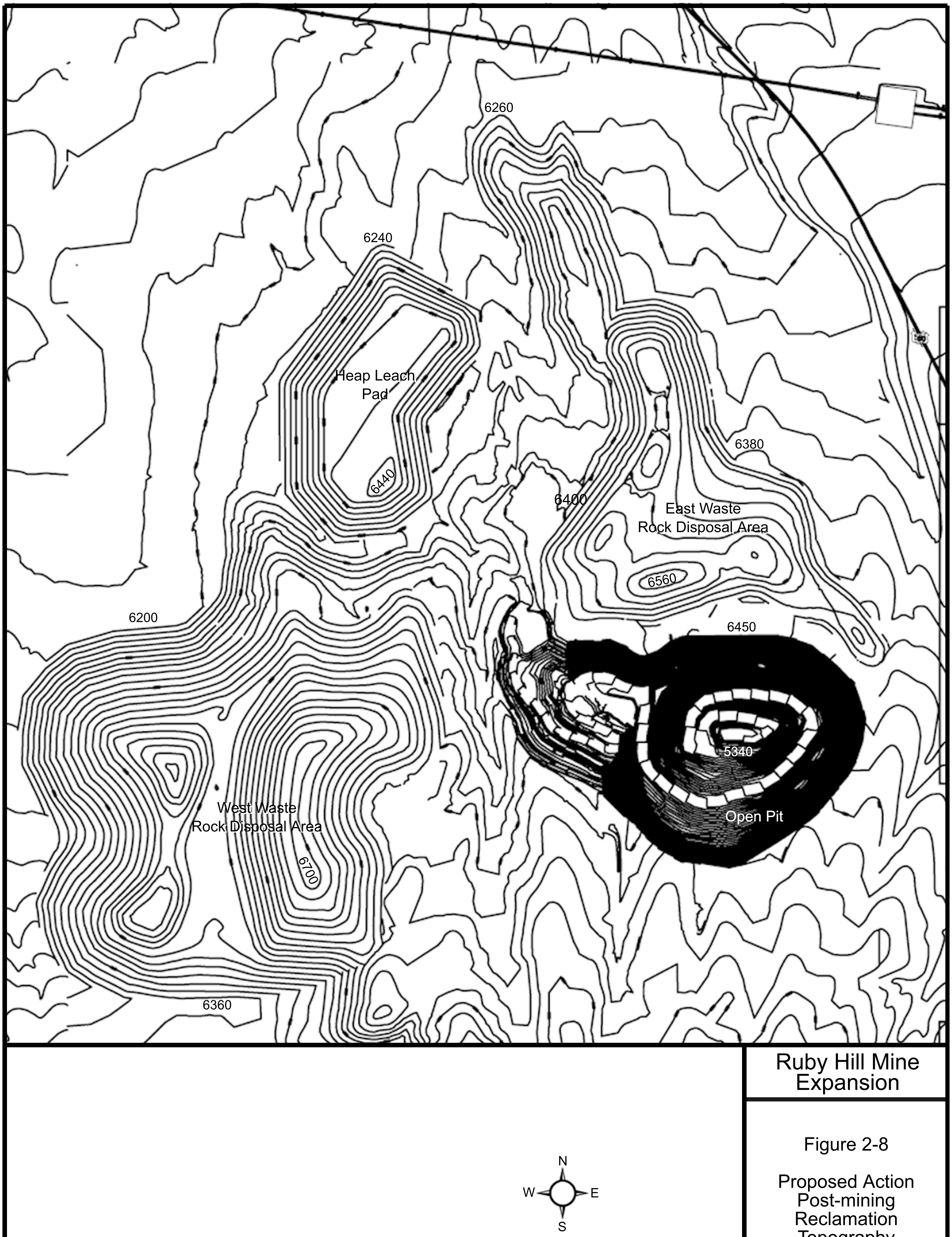
- Utilization of proper growth media management techniques, including salvage, stockpiling, and possible reapplication, to establish surface soil conditions that would enhance regeneration of a reclaimed disturbed terrestrial plant community;

- Revegetation of disturbed areas, where practical, using plant species adapted to site conditions in order to establish a long-term productive biotic plant community compatible with proposed future land uses; and

- Consideration of public safety through the stabilization, removal, or fencing of structures or landforms that could constitute a public hazard.

2.3.15.1 Current Reclamation

In accordance with the previously approved Reclamation Plan for the original Ruby Hill Mine, Homestake conducted concurrent reclamation between 1997 and 2002 during previously permitted mining operations. To date, approximately 486 acres of mine-related disturbance have been reclaimed, for which the Ruby Hill Mine has received two interagency reclamation awards. The reclaimed areas were resloped and recontoured prior to seeding to blend with the surrounding topography, and native plant species in the reclamation seed mix have been successfully established. Additionally, over 110,000 seedlings have been planted on the mine site, consisting of serviceberry, bitterbrush, juniper, piñon, mountain mahogany, and sagebrush. Survival rates of these seedlings have ranged from a low of less than 20 percent for both piñon and juniper to greater than 70 percent for sagebrush. Based on these planting results and the species'



Ruby Hill Mine Expansion

Figure 2-8

Proposed Action Post-mining Reclamation Topography

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tendency to successfully encroach naturally, the planting of piñon and juniper seedlings is not proposed for the mine expansion reclamation program. However, serviceberry, bitterbrush, mountain mahogany, and sagebrush seedlings would continue to be utilized.

2.3.15.2 Reclamation Scheduling

Reclamation activities would be scheduled as soon as possible after mining activities in a particular area are completed and to take advantage of optimal climatic conditions. In general, grading and drainage control work would be conducted in mid- to late-summer, seedbeds would be prepared in early fall just prior to seeding, and seeding would be completed between October and April to take advantage of winter and spring moisture. Selective watering of seeded areas also may be implemented to encourage better response in sensitive areas or to mitigate unusually dry conditions.

2.3.15.3 Growth Media Stockpiling and Use

Based on the success of current reclamation practices at the mine site, Homestake proposes to use alluvial overburden from the expanded pit as a growth media; therefore, topsoil from the proposed pit expansion, waste rock disposal and heap leach pad expansions, and stockpile areas would not be stripped prior to use. Selected growth media would be placed in designated stockpile areas or applied directly to sloped faces (see **Figure 2-3**). The stockpiles would be constructed with a slope of 3.0H:1.0V, seeded with an interim reclamation seed mix (see **Table 2-6**) to mitigate the potential for water and wind erosion, and signed for future identification. The area around the stockpile may be surrounded by a ditch to contain any material sloughed or eroded from the pile. Growth media removed from access and haul road, diversion channel, and overflow pond areas would be used to construct safety berms, which also would be seeded, as necessary, to stabilize soils.

Table 2-6
Interim Reclamation Seed Mix

Species	Seed[1] (pounds pure-live-seed/acre)
Crested Wheatgrass	20
Yellow Sweetclover	4
Fourwing Saltbrush	4

[1]Application rate is for broadcast seeding.

Based on favorable previous test plot results achieved at the existing Ruby Hill Mine, the proposed minimum growth media replacement depth would be 6 inches for the waste rock facilities and 6 inches for the heap leach facility. Based on a 6-inch minimum depth, approximately 876,400 tons (or 564,532 loose cubic yards) of growth media would be required to reclaim these facilities (**Table 2-7**). It is projected that more than 1 million tons of suitable growth media would be available for salvage from the pit expansion area. This proposed growth media replacement depth will be reviewed in coordination with the NDEP for specification in the final closure plan for the Ruby Hill Mine.

Table 2-7
Required Growth Media Volumes for Waste Rock and Heap Leach Expansion Facilities

Facility	Reclamation Acreage[1]	Growth Media Replacement Depth (feet)	Required Volume of Growth Media (loose cubic yards[2])	Swell Factor (percent)	Growth Media Presalvage Volume (bank cubic yards[3])	Density (tons/ bank cubic yard)	Required Tons of Growth Media
West Waste Rock Disposal Area	410	0.5	330,500	20	275,417	1.863	513,101
East Waste Rock Disposal Area	170	0.5	136,951	20	114,125	1.863	212,616
Heap	100	0.5	97,081	20	80,901	1.863	150,719
Total	**680**	**--**	**564,532**	**--**	**470,443**	**--**	**876,436**

[1] The reclamation acreage is a conservative estimate based on the asbuilt view rather than plan view of the facilities.
[2] Loose cubic yards = volume of material broken up.
[3] Bank cubic yards = volume of material in its original undisturbed or unbroken state.

2.3.15.4 Grading and Stabilization

Following construction activity, interim and concurrent reclamation of cut and fill slopes and borrow areas would be conducted. This may include placement of growth media and seeding in areas that would not be redisturbed in the future. Interim seeding would be conducted in areas that potentially would be redisturbed in the future. The waste rock disposal areas and heap leach facility would be regraded to create land forms that are compatible with the reclamation objectives, prior to growth media placement and seeding.

2.3.15.5 Surface and Seedbed Preparation

Following final grading, the waste rock facilities and heap leach pad would be inspected for slope stability, relief, topographic diversity, acceptable surface water drainage capabilities, and compaction, where appropriate. Prior to placement of growth media, and if conditions warrant, some surfaces may be ripped and scarified. Following placement of growth media, the final surface would be contour scarified to promote water retention, reduce erosion, and prepare the final seedbed.

2.3.15.6 Seeding Mixtures and Rates

Seeding typically would be accomplished by broadcast seeding and dragging or drilling. The seed mix presented in **Table 2-8** was developed based on previous site-specific field testing and is designed to optimize forage potential of reclaimed sites and improve their overall stability. Slight variations in specific seed rates may be utilized based on species success in other locations on the minesite. Acceptable species substitutes also may be incorporated into the mix as agreed upon in coordination with the BLM, NDEP, and NDOW. Planting of selected woody shrubs on the waste rock facilities would continue during operation of the proposed expansion. Woody species planting primarily would be conducted on north- and west-facing slopes and would be conducted in a manner to mimic woody vegetation patterns of the surrounding natural landscape.

Table 2-8
Final Reclamation Seed Mix

Species	Seed[1] (pounds pure-live-seed/acre)	Seedlings (each/acre)
Seed Mix and Plantings for Dumps/Seed Mix for Heap Leach Pad		
Antelope Bitterbrush	2	--
Winterfat	2	--
Fourwing Saltbrush	3	--
Small Burnet	3	--
Palmer Penstemon	2	--
Blue Flax	2	--
Cicer Milkvetch	2	--
Yellow Sweet Clover	2	--
Bluebunch Wheatgrass	4	--
Western Arriba Wheatgrass	4	--
Sandberg Bluegrass	2	--
Canbar Bluegrass	2	--
Basin Wildrye	2	--
Thickspike Critana Wheatgrass	2	--
Basin Big Sagebrush	--	up to 200
Utah Serviceberry	--	up to 50
Antelope Bitterbrush	--	up to 100
Mountain Mahogany	--	up to 50
Total	**34**	**--**
Seed Mix for Valley Floor		
Indian Ricegrass	2.5	--
Basin Wildrye	2.5	--
Squirreltail	4.5	--
Winterfat	2.5	--
Total	**12.0**	**--**

[1]Reduce broadcast application rate by one-half for drill seed application rate.

2.3.15.7 Weed Control

During vegetation establishment, weed control practices would be implemented to limit the growth and spread of noxious weeds and to ensure that revegetation is successful with the proposed seed mixtures. Weed control practices would be implemented in coordination with the BLM and Diamond Valley Weed District to limit the spread of noxious weeds in the project-disturbance areas and to ensure successful reclamation.

2.3.15.8 Facility Reclamation

Mine Pit Reclamation and Security

The objective of mine pit reclamation is to create a safe and stable topographic feature. Following the completion of mining, the in-pit benches, highwalls, and haul roads would be left in place. The steepness and configuration of the final pit walls would preclude public access for recreational use. Therefore, in order to maintain long-term public safety and minimize public access, a 200-foot-wide safety berm setback area would be established around the perimeter of the pit. The safety berm (that would be revegetated) would be 30 feet wide and 13 to 14 feet in height and would be built around the outer edge of the setback area. In addition, a chain-link fence would be installed around the outside of the safety berm. The bottom elevation of the pit expansion area (approximately 5,340 feet amsl) would be below the groundwater table (approximately 5,910 feet amsl). As a result, after dewatering activities cease, a pit lake would form in the bottom of the pit.

Waste Rock Disposal Areas

The waste rock disposal areas would be constructed and reclaimed to blend into the surrounding topography to the extent practical. The waste rock disposal areas would be constructed in approximately 50-foot lifts by conventional end dumping methods. Waste rock disposal area construction methods are described in Section 2.3.4, Expansion of Waste Rock Disposal Areas. The angle of repose slopes would be reduced to approximately 3H:1V undulating slopes (without benches), and revegetation activities would be initiated. Following placement of growth media, the facilities would be seeded, and select woody shrub seedlings will be planted to increase ecologic diversity (see **Table 2-6**). Drainages would be maintained on either side of the facilities as conditions warrant.

Crushing and Processing Facilities

Buildings and structural materials, equipment, and hazardous or toxic materials associated with the crushing and processing facilities would be removed and disposed of in accordance with appropriate federal and state regulations, although some buildings located on private land may remain for future use. Foundations would be broken-up and buried. The area would be regraded for drainage and to blend with adjacent topography and subsequently seeded.

Heap Leach Facilities

Reclamation procedures for the heap leach facility were developed considering ore and solution characteristics, site conditions, and climatic conditions. The reclamation phases for the heap leach facility include:

- Heap draindown;
- Heap regrading, resoiling, and revegetation;
- Solution management; and
- Pond reclamation.

Details of heap neutralization and closure would be developed 2 years prior to project closure pursuant to the requirements of the NDEP (NAC 445A.446 and 445A.447).

Heap Draindown. It has been estimated that heap draindown flows would decrease by greater than 95 percent within 2 years of cessation of active leaching.

Solution Management. It is anticipated that the short-term heap draindown management plan would combine enhanced evaporation and a contained, NDEP-approved land application system with enhanced evaporative spray nozzles installed on the heap application spray system. The system would include recirculation of solution back onto the heap to evaporate solutions. Evaporation nozzles also may be used in the solution pond and event ponds to further accelerate evaporation of solution.

Any long-term effluent discharge would be managed pursuant to the requirements of the NDEP (NAC 445A.446 and 445A.447). This may include attenuating leach fields, evaporation-transpiration cells, or another NDEP-approved method as would be determined in coordination with the NDEP prior to the completion of leaching.

Heap Regrading, Resoiling, and Revegetation. The heap grading would be conducted to eliminate benches, reduce the side slopes to an approximate 3H:1V grade, and round off the heap edges to more natural contours. Growth media subsequently would be applied (to a minimum depth of 6 inches) to the regraded heap. The prepared heap would be scarified to prepare a final seedbed and then seeded.

Pond Reclamation. After the draindown solution has evaporated, the solution pond and storm event ponds would be reclaimed. The pond reclamation plan may include incorporation into the solution management system or conventional closure that would include the testing of pond sediments for hazardous constituents, folding of liners into the pond areas, ripping of liners, backfilling with excavated growth media that would be stockpiled in the pond berms, grading the ponds to provide free drainage and to blend into the adjacent topography, and seeding.

Infiltration Basin

The infiltration basin would be reclaimed after their use is no longer required for site operation. At that time, the basin would be regraded to blend with the surrounding topography and reseeded.

Roads

Once haul and access roads are no longer deemed necessary, those external to the pit would be recontoured to approximate original contours, culverts removed or plugged, and the area revegetated. Road surfaces at grade would be ripped to a depth of at least 12 inches to reduce compaction. Growth media previously stripped and stockpiled along the roadways during construction may be reapplied prior to seeding on heavier use roads. In-pit roads would not be reclaimed.

Borrow Areas

The reclamation of borrow areas would include the regrading of side slopes, preparation of a seedbed by ripping, and seeding.

Dewatering Wells

Mine dewatering wells and monitoring wells would be plugged and abandoned according to State of Nevada water well requirements contained in Nevada Revised Statutes 534.421 and 534.428. Homestake considers the project's fresh water wells to be an economic resource that may be utilized for post-mining purposes, including irrigation in the Diamond Valley area.

Ancillary Facilities

All ancillary facilities not deemed appropriate for retention would be decommissioned, and all associated equipment would be removed or salvaged, if possible. Building foundations would be mechanically fractured, buried, and the area graded to allow for drainage and to blend the sites into the adjacent topography. The final surfaces would be contour ripped or scarified to prepare a seedbed and revegetated. Growth media would be added to these sites, as necessary.

Diversion ditches would be evaluated at project closure to determine if they should be removed or left in place. If removed, the associated surface disturbance would be regraded and reclaimed. If left in place, their condition would be reviewed to ensure that they would be maintenance-free after site reclamation has been completed.

Following completion of project operations, the water line between the water wells on the Collingwood Ranch and the project site would be removed or plugged with cement at both ends.

The permitted Class III landfill would be closed in accordance with appropriate State of Nevada regulations. This would include placement of a compacted soil cap, site regrading to provide drainage and inhibit infiltration of meteoric waters, and revegetation.

Exploration Drill Hole Abandonment

After data have been gathered from exploration drill holes, they would be abandoned pursuant to NAC 534.4371 or the State Engineer's Office guidelines.

2.4 No Action Alternative

The proposed expanded facilities that comprise the Ruby Hill Mine Expansion – East Archimedes Project would not be constructed under the No Action Alternative. Under this alternative, Homestake would continue to recover gold and silver at the existing heap leach facilities as currently authorized by the BLM and State of Nevada for the existing Ruby Hill Project.

2.4.1 Existing Operations

Mining activities, including development of the waste rock disposal areas, and crushing and grinding operations associated with the existing operations, have been completed. Existing facilities that would continue to operate under the No Action Alternative would include the heap leach facility and ADR plant.

Operation of these processing facilities would continue until the processing of previously mined ore is completed. Existing facilities are presented in **Figure 2-2**.

2.4.1.1 Schedule and Work Force

Approximately 14 workers currently are employed at the Ruby Hill Project for heap leaching, processing, and reclamation. Under the No Action Alternative, leaching operations are anticipated to continue through 2004. Decommissioning and final reclamation would continue for approximately another 2 years with a work force of approximately 5 to 10 individuals. The average annual operations work force payroll for the remainder of the project would be approximately $500,000.

2.4.1.2 Existing Pit

The existing West Archimedes Pit (approximately 88 acres) is discussed in detail in the Ruby Hill Project Final EIS (BLM 1997a). The bottom elevation of the existing pit (approximately 5,940 feet amsl) is above the groundwater table (approximately 5,910 feet amsl). As a result, there would be no pit lake development under this alternative. No additional mining of this pit would occur under this alternative.

2.4.1.3 Existing Waste Rock Disposal Areas

The existing West and East waste rock disposal areas are discussed in detail in the Ruby Hill Project Final EIS (BLM 1997a). The existing East Waste Rock Disposal Area is approximately 7,000 feet by 1,200 feet (153 permitted acres), approximately 125 feet in height, and contains approximately 17 million tons of waste rock. The West Waste Rock Disposal Area is approximately 2,500 feet by 2,100 feet (157 permitted acres), approximately 225 feet in height, and contains approximately 31 million tons of waste rock. In addition, the northwestern portion of the open pit partially was backfilled with approximately 3 million tons of waste rock. No additional waste rock would be placed in these facilities under this alternative.

2.4.1.4 Existing Heap Leach Facility

The existing heap leach facility is discussed in detail in the Ruby Hill Project Final EIS (BLM 1997a) and summarized in Section 2.3.6, Expansion of Heap Leach Facilities, of this SEIS. The currently permitted heap leach pad is approximately 1,900 feet by 1,800 feet (84 acres) in size and 120 feet in height. The facility contains approximately 7 million tons of previously mined leach ore.

Under the No Action Alternative, ore would continue to be leached at average and maximum leach solution application rates of 0.0025 to 0.005 gpm/ft^2 until recovery has been completed.

2.4.1.5 Adsorption, Desorption, and Recovery Plant

The existing ADR plant is discussed in detail in the Ruby Hill Project Final EIS (BLM 1997a) and summarized in Section 2.3.7, Existing Adsorption, Desorption, and Recovery Plant, of this SEIS. The ADR plant was designed to process gold-bearing solution at a rate of approximately 1,000 gpm from the grinding circuit and 1,000 gpm from the heap leach circuit. Under the No Action Alternative, the ADR plant would continue to operate for the processing of gold-bearing solution from the heap leach circuit. The processing of gold-bearing solution from the grinding circuit was terminated in 2002 following the completion of the mining and crushing and grinding operations. The ADR plant currently uses approximately 175 gpm (280 acre-feet per year) of process water. The solution pond is designed to hold 1,460,000 gallons; the event pond is designed to hold 3,890,000 gallons.

2.4.1.6 Current Water Supply

Fresh water for the existing Ruby Hill Project would continue to be obtained from the existing water wells at the Homestake-owned Collingwood Ranch, as discussed in Section 2.3.8, Water Supply, or a recently developed well on the project site. The project would continue to use approximately 15 acre-feet per year of water for domestic uses and approximately 280 acre-feet per year of water for the process facility. The existing water tank on Mineral Point also would continue to provide a fire water reserve.

2.4.1.7 Current Electric Power Supply

Electric power for operations would continue to be provided by the Mount Wheeler Power Company via the existing overhead power line and substation. Diesel generators are in place to provide emergency power, as needed.

2.4.1.8 Other Facilities

Under the No Action Alternative, the ancillary facilities described in Section 2.3.10, Ancillary Facilities, would continue to be used for the remainder of the operation. Existing access roads would continue to be used and maintained.

2.4.1.9 Security and Fencing

The existing security system would continue to be implemented under the No Action Alternative. Existing fences would be maintained to prevent access by wildlife and livestock and to provide for public safety.

2.4.1.10 Hazardous Materials and Solid Waste

Procedures for reagent transportation and storage, waste management, and the spill prevention and emergency response programs are discussed in detail in the Ruby Hill Project Final EIS (BLM 1997a) and are summarized in Section 2.3.13, Hazardous Materials and Wastes, of this SEIS. There would be no increase in currently permitted storage volumes or consumption rates of reagents or fuels under this alternative. As leaching and reclamation is completed, the storage and usage of reagents would decline.

2.4.1.11 Environmental Protection Measures

The applicant-committed environmental protection measures for the No Action Alternative are identified in the Final Plan of Operation, Ruby Hill Project (Homestake 1996a) and Ruby Hill Project Final EIS (BLM 1997a). Monitoring and mitigation measures for the project are identified in the Ruby Hill Project ROD and Plan of Operations Approval (BLM 1997b). The majority of the environmental protection measures and monitoring and mitigation measures previously were implemented during construction and operation (e.g., installation of chain-link fence around solution ponds, installation of tanks for containment of normal process flows, etc.); others (e.g., annual bat monitoring, the use of certified weed-free mulch and seed for reclamation, etc.) have continued to be implemented during on-going operations. As appropriate, these measures would continue to be implemented throughout the life of the existing project.

2.4.2 Site Closure and Reclamation

Under the No Action Alternative (once the gold has been recovered from the heap), the existing facilities would be closed and reclaimed in accordance with the currently approved reclamation plan, current permits, and applicable federal and state closure and reclamation requirements. Final closure and reclamation of the project site are discussed in detail in the Ruby Hill Project Final EIS (BLM 1997a), and generally would be the same as described in Section 2.3.15, Reclamation, of this SEIS. Following closure and reclamation, the total disturbance area subject to mining and reclamation would be approximately 696 acres. The post-mining reclamation topography for the No Action Alternative is presented in **Figure 2-9**.

The bottom elevation of the existing pit (approximately 5,940 feet amsl) is above the groundwater table (approximately 5,910 feet amsl). As a result, there would be no pit lake development under this alternative.

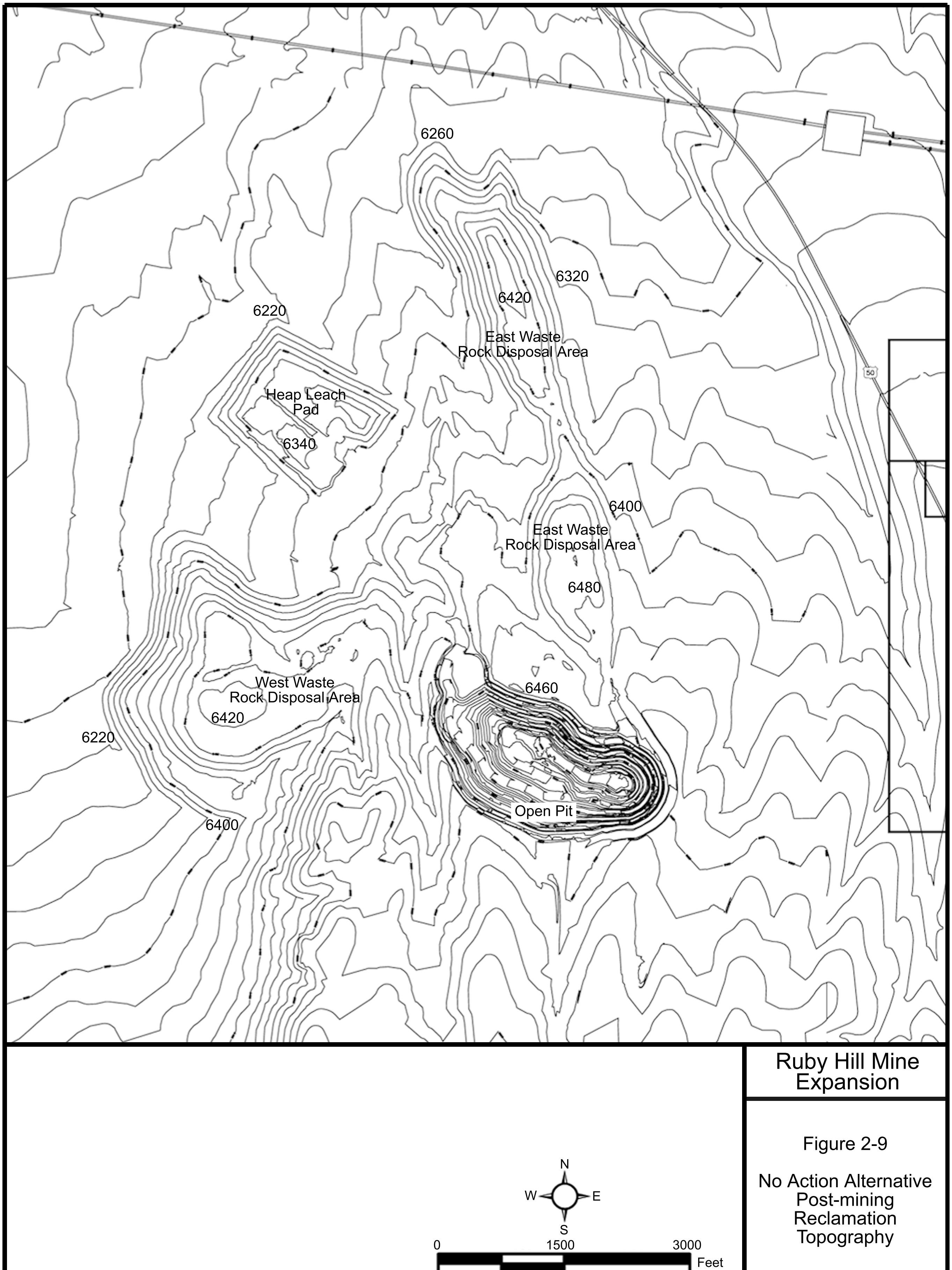
2.5 Other Project Alternatives

Homestake considered various alternatives during feasibility studies for the proposed mine expansion. The identified alternatives were considered relative to their technological and economic feasibility as well as their potential to reduce environmental impacts. Based on the BLM's evaluation, these alternatives have been considered but subsequently eliminated from detailed analysis in this SEIS. This section describes the rationale for their elimination. No additional alternatives have been identified by the BLM as a result of the scoping process or project evaluation.

2.5.1 Complete Pit Backfill

Homestake evaluated the potential for backfilling the existing West Archimedes pit with waste rock from the pit expansion area. Due to the configuration of the East Archimedes ore body and related constraints in pit design, Homestake would need to utilize the existing haul roads in the West Archimedes Pit for developing the East Archimedes Pit at depth. Given this limitation, no opportunities exist for concurrent backfilling of waste rock from the expanded pit into the existing pit without substantially increasing the overall size and, therefore, surface disturbance of the combined pits.

In a complete pit backfill scenario, the East Archimedes Pit could not be backfilled until the end of mining; therefore, the expanded waste rock disposal facilities still would be required for the temporary storage of waste rock. As a result, there would be no reduction in temporary disturbance under this alternative. In addition, backfilling with waste rock generated by the proposed pit expansion would require the rehandling of approximately 80 million loose cubic yards of material, require approximately 5 years to complete, and result in an additional project cost of nearly $60 million. Also, the water quality associated with a backfilled



Ruby Hill Mine Expansion

Figure 2-9

No Action Alternative Post-mining Reclamation Topography

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pit is not expected to be substantially different than would occur with the development of a post-mining pit lake; however, backfilling would eliminate any evaporation that would occur from the pit lake surface.

Homestake has identified potential economic gold mineralization at depth beneath the West and East Archimedes pits. Backfilling the pit with approximately 80 million loose cubic yards of material would substantially deter, if not eliminate, the economic recovery of this mineralization. Based on these combined factors, this alternative has been eliminated from further consideration.

2.5.2 Partial Pit Backfill

Under the partial pit backfill scenario, the proposed pit expansion area would be partially backfilled with waste rock up to the anticipated post-mining pit lake elevation of 5,865 feet amsl. However, as discussed in Section 2.5.1, Complete Pit Backfill, excess volume would not exist for placement of waste rock in the pit until the end of mining without substantially increasing the size of the combined pits based on the configuration of the East Archimedes ore body and related constraints in pit design. Therefore, the expanded waste rock disposal facilities still would be required for temporary storage of waste rock. As a result, there would be no reduction in temporary disturbance under this alternative. In addition, the partial backfill scenario would require the rehandling of approximately 14.5 million cubic yards of material, require approximately 1 year to complete, and result in an additional project cost of nearly $11 million. Also as discussed in Section 2.5.1, the water quality associated with a backfilled pit is not expected to be substantially different than would occur with the development of a post-mining pit lake. As with a complete pit backfill, partial backfill of the pit would substantially deter potential future development of mineral reserves identified at depth beneath the West and East Archimedes pits. Based on these combined factors, this alternative has been eliminated from further consideration.

2.5.3 Underground Mining

Homestake has evaluated the East Archimedes ore body in recent years to determine if underground mining of the ore body would be feasible. The deposit was extensively drilled and, while pockets of higher grade ore typical of underground mining targets do exist, the relatively low overall grade (average of 0.06 ounce per ton) and the disseminated nature of the East Archimedes deposit render underground mining methods uneconomic. Therefore, underground mining of the East Archimedes ore body is not considered a viable alternative at this time. Homestake anticipates continuing further mineral exploration in the area that may define potential underground mining opportunities. However, at this time, not enough is known of these potential orebodies to define and properly evaluate them as a viable underground mining option.

2.6 Past, Present, and Reasonably Foreseeable Future Actions

Cumulative impacts are those impacts on the environment that result from the incremental impact of the Proposed Action when added to the impacts of past, present, and reasonably foreseeable future actions (RFFAs), regardless of what agency (federal or non-federal) or private entity undertakes such other actions. Cumulative impacts can result from individually minor, but collectively significant actions taking place over a period of time (40 CFR 1508.7). BLM Instruction Memo NV-90-435 specifies that impacts first must be identified for the Ruby Hill Mine Expansion – East Archimedes Project before cumulative impacts with interrelated projects can occur.

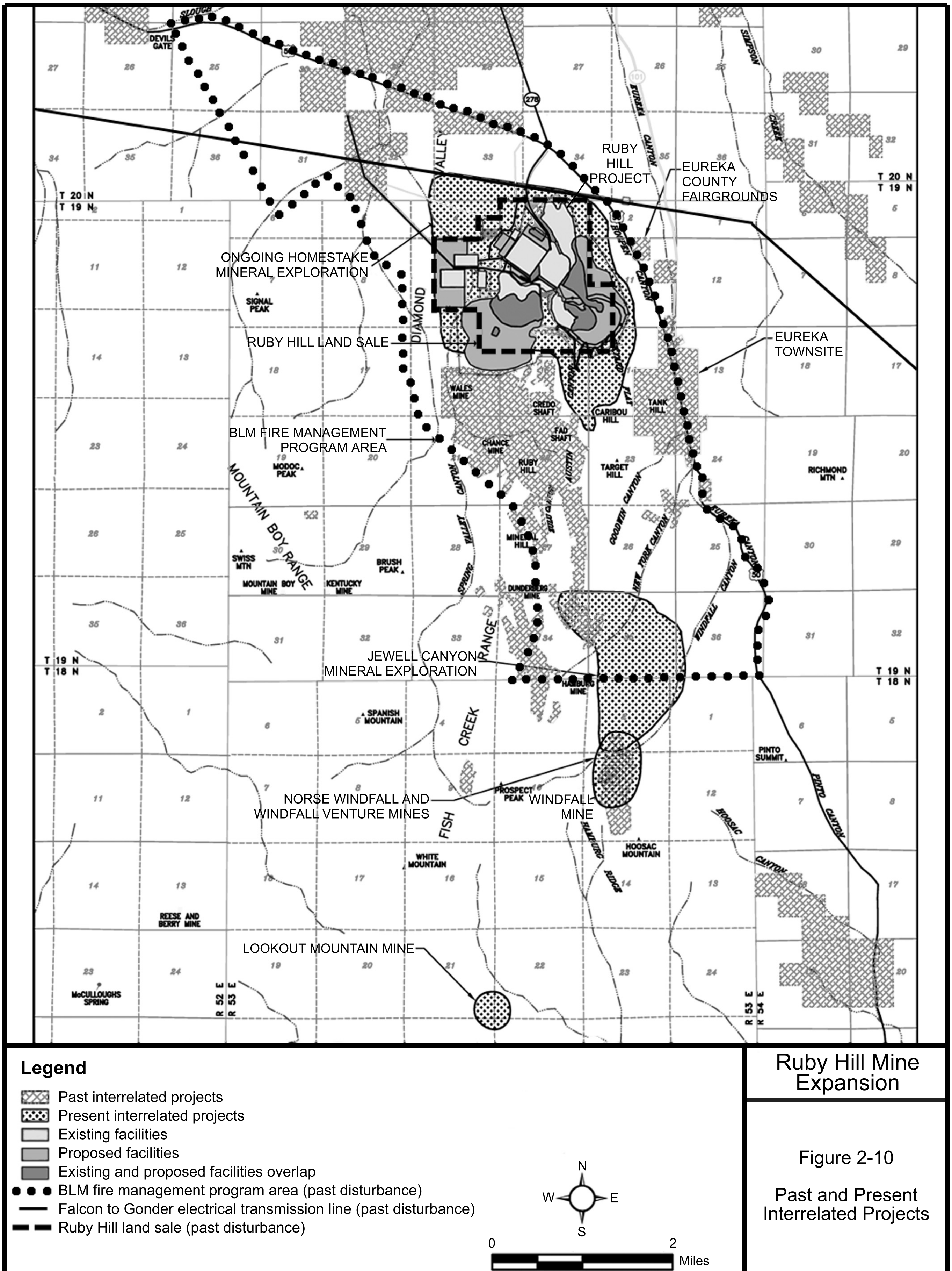
Interrelated projects are defined for this SEIS as those past, present, and RFFAs that could interact with the Proposed Action in a manner that would result in cumulative impacts. Interrelated projects are identified in **Table 2-9** and shown in **Figure 2-10**.

Table 2-9
Disturbance from Interrelated Projects

Projects	Disturbance Acreage in Cumulative Impact Area
Past Actions	
Mining Activity[1]	2,165
Eureka Town Site	548
Eureka County Fairgrounds	29
Private Agricultural Development	1,656
Falcon to Gonder Power Line	57[2]
Jewell Canyon Mineral Exploration (previous Homestake exploration)	18
Other Mineral Exploration	65
Norse Windfall Mine	220
Windfall Venture Mine	150
Lookout Mountain Mine	60
Ruby Hill Land Sale	0[3]
Subtotal	**4,968**
Present Actions	
Ruby Hill Project (previously permitted disturbance)	760[4]
Ongoing Homestake Mineral Exploration	112[5]
BLM Fire Management Program in the Eureka and Diamond Valley Areas	0[6]
Subtotal	**933**
Reasonably Foreseeable Future Actions	
Future Mining at the Ruby Hill Mine	0
Future Land Sale	0[7]
Subtotal	**0**
Total Disturbance	**5,840**

[1] The majority of historic mining disturbance has occurred on patented lands.
[2] Reflects the disturbance area for the portion of the power line that occurs within the cumulative effects area.
[3] The land sale was conducted as described in the Ruby Hill Land Sale EA (BLM 2003a). Approximately 1,644 acres were transferred to private ownership.
[4] Approximately 252 acres of the existing, previously permitted Ruby Hill Mine disturbance would be used under the proposed mine expansion. The approximately 744 acres of disturbance identified for the proposed mine expansion reflects additional new disturbance only. As a result, potential double counting of disturbance areas has been eliminated.
[5] Reflects 173 acres previously approved for exploration disturbance less 61 acres of exploration-related disturbance that subsequently was mined out by the West Archimedes Pit. This adjustment eliminates double counting of disturbance areas.
[6] The BLM fire management program is outlined in the Wildland Urban Interface/Fire Defense System, Eureka and Diamond Valley, Nevada EA (BLM 2003b). Activities are restricted to vegetation conversion; there is no related surface disturbance.
[7] The potential future land sale of approximately 400 acres only would transfer public lands to private ownership (no associated surface disturbance).

The geographic area for cumulative impacts is determined primarily by the location of the projects that are being considered in the analysis as well as the type of resource potentially affected. **Figure 2-10** shows the distribution of the primary surface-disturbing actions throughout the Eureka area. Information on these actions is presented below. The area of concern for cumulative impacts would vary by resource, with



Ruby Hill Mine Expansion

Figure 2-10

Past and Present Interrelated Projects

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impacts to certain resources being restricted to the actual area of disturbance. Other resources, such as livestock and wildlife, may range over a wide area, and cumulative impacts could involve more than surface disturbance. Resource-specific cumulative impact areas were developed for each resource, as appropriate, and are discussed in Chapter 3.0, Affected Environment and Environmental Consequences.

2.6.1 Past and Present Actions

Past disturbance (see **Table 2-9**) has resulted from historic development in the Eureka area. This includes historic mining activity, development of the Town of Eureka and the Eureka County Fairgrounds, previous mineral exploration activity, and private agricultural development in the southern end of Diamond Valley. The Eureka area has been explored and mined since the mid-1800s. The majority of the past mining activity has taken place on patented lands located west and south of the Eureka town site (see **Figure 2-10**); however, some mines are located on public land. The total historic mining disturbance shown in **Table 2-9** is approximate, as it includes disturbed areas on patented land and does not include those mines located on public land. Past disturbances also include more recent mining activities, including the Norse Windfall, Windfall Venture, and Lookout Mountain mines (see **Table 2-9**). The Windfall Mine area overlaps with the Jewell Canyon area, an area in which Homestake previously conducted exploration and currently is conducting reclamation activities.

In 2003, Homestake purchased 1,644 acres of BLM-managed land as described in the Ruby Hill Land Sale EA (BLM 2003a). Purchased lands previously were identified for disposal in the BLM's Eureka-Shoshone RMP. This past action resulted in an increase in private lands, and a corresponding decrease in public lands, in the existing Ruby Hill Mine area.

Present disturbances include Homestake's ongoing mineral exploration program and the existing Ruby Hill Mine. Homestake anticipates continuing a local mineral exploration program within and adjacent to the existing Ruby Hill Mine. This exploration program is intended to identify and, if applicable, define potential mineral resources both on Homestake-owned property and on mineral claims held by Homestake but located on public lands. Based on amendments since 1997 to the BLM-approved Mineral Point exploration program, 173 acres of exploration-related surface disturbance (drill site and access road construction, where needed) currently are permitted for this area, approximately 155 acres of which have been disturbed to date. Assuming a disturbance of approximately 0.055 acre per drill site (inclusive of sump construction) and use of existing access roads to the extent possible, Homestake anticipates an additional 30 to 60 drill sites in the project area. The program began in early 1996 and could continue throughout the life of the project. Portions of the disturbance associated with this exploration program overlap with the existing Ruby Hill Mine disturbance area. Present actions also include several notice-level mineral exploration projects (e.g., Green Castle's notice in the Jewell Canyon area) and the BLM fire management program in the Eureka and Diamond Valley areas. The fire management program, as discussed in the Wildland Urban Interface/Fire Defense Systems, Eureka and Diamond Valley, Nevada EA (BLM 2003b), provided for the treatment of up to 2,087 acres of vegetation to reduce the severity and duration of wildland fires on public lands near population centers. Identified treatment methods included high intensity/low frequency grazing and fuels manipulation (e.g., vegetation conversion).

2.6.2 Reasonably Foreseeable Future Actions

In order to qualify as a RFFA for the cumulative impact analysis, a project must impact the same resources as the proposed mine expansion, must occur within the life of the Proposed Action (including reclamation), and must have a reasonable likelihood of going forward.

An application has been submitted by Diamond Mountain Development, a limited partnership out of Houston, Texas, to the BLM Battle Mountain Field Office for installation of a wind monitoring tower in the Diamond Mountains. Collected data would be used by the company to assess the site for potential future wind energy development. Approval of the current application only would result in minimal disturbance (typically less than 0.5 acre) associated with installation of the wind monitoring tower. As a result, the currently proposed project's contribution to cumulative disturbance would be negligible. The potential for any subsequent development of a wind energy project in the area is speculative at this time. As a result, it does not meet the definition of a RFFA under NEPA.

Homestake intends to investigate opportunities to purchase the public lands proposed for disturbance in association with the Ruby Hill Mine Expansion – East Archimedes Project. This future land sale would involve the purchase of approximately 400 acres of public land. It is assumed that the BLM direct land sale process would be similar to the Ruby Hill Land Sale of approximately 1,644 acres that was completed in 2003 between the BLM and Homestake. The land sale process would be implemented in accordance with the requirements of 43 CFR 2711.3-3 that allows for the direct sale of public lands and meets criteria provided for in Section 203(a)(3) of FLMPA.

Homestake has identified potential economic gold mineralization at depth beneath the existing West Archimedes Pit and the proposed pit expansion area, which may lead to a continuation of mining in the future within the project area. Specific mine plans and methods have not currently been developed, as additional drilling and design work would be needed to determine project feasibility. However, Homestake anticipates that the deposit likely would be mined using underground methods. No additional surface disturbance would be anticipated based on the use of underground mining methods (including concurrent backfill) and the use of the existing ore processing facilities at the mine site. Alternately, ore would be shipped to other local mine sites for processing, if metallurgical conditions warranted. Dewatering likely would be required to facilitate underground mining. Dewatering volumes would be determined during baseline studies that would be conducted prior to the environmental permitting process.

2.7 Comparative Analysis of Alternatives

Table 2-10 summarizes and compares the environmental impacts between the Proposed Action and the No Action Alternative. Detailed descriptions of impacts are presented in Chapter 3.0, Affected Environment and Environmental Consequences. The summarized impacts assume the implementation of applicant-committed environmental protection measures but the absence of potential mitigation measures. Implementation of the potential monitoring and mitigation measures identified in Chapter 3.0 potentially would further reduce impacts.

2.8 BLM-preferred Alternative

In accordance with NEPA, federal agencies are required by the CEQ (40 CFR 1502.14) to identify their preferred alternative for a project in the Draft EIS, if a preference has been identified, and in the Final EIS prepared for the project. The preferred alternative is not a final agency decision; rather, it is an indication of the agency's preference.

The BLM has selected a preferred alternative based on the analysis in this SEIS; this preferred alternative is the alternative that best fulfills the agency's statutory mission and responsibilities, considering economic, environmental, technical, and other factors.

The BLM has determined that the preferred alternative is the Proposed Action as described in Section 2.3, including the applicant-committed environmental protection measures identified in Section 2.3.14 and resource-specific mitigation measures identified in Chapter 3.0 of this SEIS.

Table 2-10
Comparison of the Proposed Action and No Action Alternative

Resource Areas	Proposed Action	No Action
Air Quality	Modeling results indicate that maximum concentrations of particulate matter with an aerodynamic diameter of 10 microns or less (PM_{10}), nitrogen dioxide (NO_2), carbon monoxide (CO), and sulfur dioxide (SO_2) would not exceed Nevada or National Ambient Air Quality Standards (AAQS). There would be no impacts to Prevention of Significant Deterioration (PSD) Class I areas.	Potential impacts to air quality would be limited to ongoing mineral processing and reclamation activities.
Geology and Minerals	Direct impacts to geologic and mineral resources would include the generation and disposal of approximately 60 million tons of rock overburden, 130 million tons of alluvial overburden, and 18 million tons of ore. In addition, 744 acres of alluvial fan deposits would be disturbed. Mined ore permanently would be removed from existing reserves.	No additional removal of ore or overburden from the existing pit or further alteration of the original topography in the existing mine area would occur.
Paleontology	No impacts to scientifically significant or critical fossil resources are anticipated.	No impacts to paleontological resources beyond those that may have occurred during previous construction and mining activities.
Water Quality and Quantity		
Surface water quantity	The proposed mine expansion is not expected to have a substantial impact on surface water quantity due to the absence of perennial streams in the project area; intermittent stream segments would be removed or filled during construction of the East Archimedes Pit. No impacts to seeps or springs are expected from mine expansion activities.	No additional impacts to intermittent drainages or perennial springs, seeps, or springs would occur.
Surface water quality	Sedimentation effects on surface water would be minimal. Based on the proposed reclamation procedures, no impacts to surface water quality are anticipated as a result of the proposed expansion of the waste rock disposal areas.	Impacts would be similar to those described for the Proposed Action.
Waste rock management	No acidic or metal-laden seeps are expected from the proposed waste rock disposal expansion areas based on geochemical test results, the proposed placement of sulfide-bearing rock (less than 3 percent of the waste rock) below the surface of the waste rock facilities, and proposed reclamation procedures.	Impacts associated with the existing waste rock disposal facilities would be similar to those described for the Proposed Action.
Groundwater quantity	Withdrawal of 500 to 1,000 gpm of groundwater from the carbonate bedrock for a period of 7 years is projected to result in a maximum drawdown of 10 feet in the alluvial aquifer northeast of the project. The drawdown is expected to have no impact on irrigation wells in the southern part of Diamond Valley. The town of Eureka would experience 10 to 20 feet of drawdown in the bedrock aquifer beneath the town as a result of dewatering. Due to the type of geologic material under the town (volcanic and carbonate bedrock), no subsidence-related effects would be anticipated in this location. Backup water supply wells in the town of Eureka would be within the projected groundwater drawdown area and could experience up to 20 feet of drawdown. Groundwater drawdown potentially would result in a maximum ground subsidence of approximately 0.1 to 0.25 foot along the road leading north from Eureka, Nevada. Subsidence effects on public facilities in this area would depend on the actual amount of subsidence, specific geologic material in the area of subsidence (alluvium), and the type of facility affected. Approximately 40 years would be required for groundwater levels to recover to 95 percent of current levels. Reinjection or infiltration of excess groundwater into the alluvial aquifer of the southern Diamond Valley would create a temporary groundwater mound. Producing wells in the area of mounding could experience a temporary rise of approximately 10 to 50 feet in the alluvial water table.	No groundwater would be pumped from the Ruby Hill Mine area; no reinjection or infiltration would occur.

Table 2-10 (Continued)

Resource Areas	Proposed Action	No Action
Groundwater quality	No groundwater quality impacts are anticipated as a result of injection/infiltration activities or development of the waste rock disposal facility expansion areas. Groundwater contamination by leach solution is not anticipated from the operation of the heap leach pad expansion.	Contamination of the groundwater is not anticipated from the ongoing processing associated with the existing mine operations.
Pit lake formation	Based on the groundwater modeling results, it is anticipated that the post-mining pit lake water quality would be within Nevada stock water standards for all constituents.	The floor of the existing West Archimedes Pit is above the groundwater table.
Soils	Approximately 744 acres of soil would be disturbed during mine development. Growth media from the 100-acre pit expansion area would be salvaged and stockpiled, as necessary, for use in reclamation.	Additional impacts to soils would be avoided since additional ground-disturbing activities would not occur.
Vegetation Resources		
General vegetation impacts	Mine development and operation would remove or disturb 744 acres of vegetation, of which 451 acres and 293 acres would occur in tree-dominated and shrub-dominated communities, respectively. Long-term impacts would occur from the conversion of tree-dominated communities to grass/forb-dominated communities. Reclamation would be completed on all mine disturbance areas except for the 100-acre pit expansion area.	Additional impacts to vegetation would be avoided since additional ground-disturbing activities would not occur.
Special status species	No impacts to special status plant species would occur.	Same as the Proposed Action.
Range Resources	Temporary loss of 34 animal unit months and permanent loss of 3 animal unit months.	Additional impacts to grazing would not occur.
Woodland Products	The long-term change in vegetation and loss of woodland productivity would not result in substantial impacts since the project area is located within a general area where abundant pinon-juniper woodlands exist on public lands. Singleleaf pinon trees on BLM-administered lands within the proposed disturbance area would not be available for Christmas tree cutting in the long term.	Additional impacts to woodland products would not occur.
Invasive and Non-native Species	Additional populations of invasive and non-native species are not anticipated to become established within the project area in the long term with the successful reclamation of mine disturbance areas and implementation of weed control practices.	Additional ground-disturbing activities would not occur, thereby minimizing the potential for the establishment of new populations of invasive and non-native species within the project vicinity.
Wildlife Resources		
Terrestrial Wildlife		
Wildlife habitat	Approximately 744 acres of habitat would be disturbed. Approximately 100 acres of terrestrial habitat associated with the pit expansion would not be reclaimed; potential increase in aquatic habitat associated with the pit lake.	No additional wildlife habitat would be disturbed. No potential aquatic habitat would be created.
Mule deer year-long and low-density range	Approximately 456 acres of year-long range, and approximately 288 acres of low-density range, would be disturbed, of which approximately 100 acres would not be reclaimed. Associated impacts are anticipated to be low.	No additional disturbance of year-long or low-density range.
Impacts to breeding birds	Direct impacts to bird species would include the temporary loss of approximately 644 acres, and permanent loss of approximately 100 acres, of potentially suitable breeding, roosting, and foraging habitat. Potential direct impacts to breeding birds (i.e., loss of nests, eggs, or young) would be minimized by clearing of vegetation outside of the breeding season, to the extent possible, and the implementation of breeding bird surveys and appropriate mitigation, as needed, in coordination with the BLM and NDOW.	No additional impacts to habitat; ongoing reclamation would continue to reduce habitat impacts in existing disturbance areas. No impacts to nesting birds, including raptor and passerine species, would occur.

Table 2-10 (Continued)

Resource Areas	Proposed Action	No Action
Human presence and noise	Increased noise, traffic, and human presence associated with mine development and operation is expected to result in negligible to low impacts to wildlife.	Effects associated with noise and human presence would remain the same as current levels until ongoing processing and reclamation have been completed, at which time these effects would cease.
Cyanide effects	Fences, wildlife exclusion devices (e.g., netting or floating material), and piping would be installed to prevent access of wildlife to cyanide solutions. The potential for impacts to wildlife resources from cyanide ingestion would be low.	Impacts would be same as described for the Proposed Action.
Potential for hazardous materials spill effects to wildlife	The potential for impacts to wildlife would be highest if a potential spill enters aquatic habitat; however, the probability of a spill into aquatic habitats along the transportation corridor would be low.	Hazardous materials used for ongoing processing would continue to be transported to the existing mine site. Impacts would be the same as described for the Proposed Action.
Potential impacts to wildlife associated with pit lake water quality	No impacts are anticipated. Based on modeling, pit lake waters would meet Nevada stock water standards.	No impacts to wildlife would occur; the West Archimedes Pit would not have a pit lake.
Special Status Species		
Golden eagles	Temporary loss of approximately 644 acres of foraging habitat, until reclamation has been completed and vegetation has been reestablished, and permanent loss of approximately 100 acres of potential foraging habitat in association with the pit expansion. The impact would be considered negligible based on the overall availability of suitable foraging habitat in the vicinity.	No additional impacts to foraging habitat would occur.
Ferruginous hawks	Potential direct impacts to breeding ferruginous hawks could include abandonment of a breeding territory or nest site or the potential loss of eggs or young, which would reduce productivity for that breeding season. Based on the implementation of breeding bird surveys and of appropriate mitigation, as needed, the results of the on site monitoring program between 1997 and 2004, and the existing level of activity at the site, potential impacts to breeding hawks would be considered low to moderate. Impacts would result from the long-term loss of approximately 359 acres, and permanent loss of 100 acres, of potentially suitable breeding habitat until mature juniper trees have reestablished in the project disturbance. The impact to availability of foraging habitat would be considered negligible based on the overall availability of suitable foraging habitat in the vicinity.	No additional impacts to breeding pairs or breeding or foraging habitat would occur.
Swainson's hawks	Direct impacts would include the temporary loss of approximately 644 acres of potential foraging habitat, until reclamation has been completed and vegetation has been reestablished, and the permanent loss of approximately 100 acres of foraging habitat in the pit expansion area. This impact would be considered negligible based on the overall availability of suitable foraging habitat in the vicinity.	No additional impacts to foraging habitat would occur.
Prairie falcon	Direct impacts would include the temporary loss of approximately 644 acres of potential foraging habitat, until reclamation has been completed and vegetation has been reestablished, and the permanent loss of approximately 100 acres of potential foraging habitat in the pit expansion area. This impact would be considered negligible based on the overall availability of suitable foraging habitat in the vicinity.	No additional impacts to foraging habitat would occur.

Table 2-10 (Continued)

Resource Areas	Proposed Action	No Action
Greater sage grouse	Direct impacts to this species would include the long-term loss of approximately 233 acres, and permanent loss of approximately 8 acres, of wintering sagebrush habitat. This impact would be considered negligible based on the overall availability of suitable wintering habitat in the vicinity.	No additional impacts to wintering habitat would occur.
Burrowing owl	Potential direct impacts to breeding owls (i.e., loss of nests, eggs, or young) would be minimized by clearing of vegetation outside of the breeding season, to the extent possible, and the conduct of breeding bird surveys and implementation of appropriate mitigation, as needed, in coordination with the BLM and NDOW. Direct impacts to this species could include the temporary loss of approximately 278 acres of potential breeding and foraging habitat, until reclamation has been completed and vegetation has been reestablished, and the permanent loss of approximately 3 acres of breeding and foraging habitat in association with the pit expansion. This impact would be considered negligible based on the overall availability of suitable breeding and foraging habitat in the vicinity.	No additional impacts to breeding owls or breeding or foraging habitat.
Pinyon jay	Potential direct impacts to breeding jays (i.e., loss of nests, eggs, or young) would be minimized by clearing of vegetation outside of the breeding season, to the extent possible, and the conduct of breeding bird surveys and implementation of appropriate mitigation, as needed, in coordination with the BLM and NDOW. Long-term impacts would result from the long-term loss of approximately 359 acres of potential breeding and foraging habitat, until mature juniper trees have reestablished in project disturbance areas, and the permanent loss of approximately 92 acres of potential breeding and foraging habitat in the pit expansion area. This impact would be considered negligible based on the overall availability of suitable breeding and foraging habitat in the vicinity.	No additional impacts to breeding jays or breeding or foraging habitat.
Vesper sparrow	Direct impacts to breeding pairs as a result of mine expansion-related activities and applicable environmental protection measures to minimize these impacts would be similar to those described for the pinyon jay. Direct impacts to this species would include the temporary loss of approximately 233 acres of potential breeding and foraging habitat, until reclamation has been completed and vegetation has been reestablished, and the permanent loss of approximately 8 acres of potential foraging habitat in association with the pit expansion. This impact would be considered negligible based on the overall availability of suitable breeding habitat in the vicinity.	No additional impacts to breeding pairs or breeding or foraging habitat.
Juniper titmouse	Long-term impacts would result from the long-term loss of approximately 359 acres of potential foraging habitat, until mature juniper trees have reestablished in project disturbance areas, and the permanent loss of approximately 92 acres of potential foraging habitat in association with the pit expansion.	Potential impacts would be similar to those described for terrestrial wildlife.
Loggerhead shrike	Direct impacts to breeding pairs as a result of mine expansion-related activities and applicable environmental protection measures to minimize these impacts would be similar to those described for the pinyon jay. Direct impacts to this species would include the temporary loss of approximately 644 acres of potential breeding and foraging habitat, until reclamation has been completed and vegetation has been reestablished, and the permanent loss of approximately 100 acres of nesting and foraging habitat in association with the pit expansion.	Potential impacts would be similar to those described for terrestrial wildlife.

Table 2-10 (Continued)

Resource Areas	Proposed Action	No Action
Bats	Direct impacts would include the loss of foraging habitat, including the short-term loss of approximately 52 acres of grassland habitat, long-term loss of approximately 592 acres of shrub and woodland habitat, and the permanent loss of approximately 100 acres of shrub and woodland habitat in association with the pit expansion. Direct loss of potential roosting habitat associated with burial of the Silver West Complex. Mine-related alteration of air flow in the remaining underground workings indirectly could affect the continued suitability of the workings as hibernacula and/or maternity roosts. Noise or vibrations from mine blasting could affect hibernating bats, and could lead to the loss of maternity roosts, nursery colonies, and hibernacula, which would be considered an adverse impact to the local bat population. Maintenance of existing bat gates, construction of cupola structures, and ongoing monitoring would minimize impacts to bat species.	No additional impacts to bats or foraging or roosting habitat would occur.
Pygmy rabbit	Development of mine expansion facilities would result in the long-term loss of approximately 233 acres, and permanent loss of approximately 8 acres, of potentially suitable habitat for this species. This impact would be considered low to moderate, depending on the relative habitat quality. Project construction likely would result in the direct mortalities of individual rabbits, if present. The loss of individual pygmy rabbits would not result in population-level effects.	No additional impacts to pygmy rabbits or their habitat would occur.
Land Use Authorizations and Access		
Land Use Authorizations	Approximately 112 acres of public land that have been determined by the BLM to be suitable for disposal would not be available during mining, approximately 25 acres of which would be permanently excluded as a result of the pit expansion. No impacts to the potential future growth of Eureka are expected based on the availability of disposal lands adjacent to the current town boundary.	No additional impacts to land use or access would occur.
Rights-of-way	An approximately 0.1-mile-long section of the existing power line for the Ruby Hill Mine would be relocated; the ROW would be on private land.	Existing ROWs in the project area would not be affected.
Access	Ore hauling from the Ruby Hill Mine to the Goldstrike Mine would have minimal impact on SR 278 north and a slight impact to the town of Carlin. Access to public and private lands in the study area would not be adversely affected.	Ore hauling from the Ruby Hill Mine to the Goldstrike Mine would not occur. Access to public and private lands in the study area would not be affected.
Closure/reclamation	Closure, abandonment, and reclamation would return lands to their pre-mining land use, except for the pit expansion area. With the exception of the pit expansion area, disturbance areas would be recontoured and revegetated, and access to public lands would be established.	Ongoing reclamation of existing mine-related disturbances would continue.
Recreation and Wilderness	No parks, concentrated recreational use areas, BLM Wilderness Study Areas (WSAs), designated wilderness areas, or protected natural areas would be directly affected. Approximately 190 acres of public lands would not be available for dispersed recreation during mining, approximately 25 acres of which would be permanently excluded as a result of the pit expansion. The reduction of land available for dispersed recreation would be a minimal adverse impact, based on current usage and the availability of public, open-space lands in the area.	Existing mine-related impacts to recreation would continue beyond mine closure as a result of the 1999 Ruby Hill land sale that transferred ownership of the existing mine site from public to private.

Table 2-10 (Continued)

Resource Areas	Proposed Action	No Action
Visual Resources	Construction of the proposed project facilities would be consistent with the applicable BLM Visual Resource Management (VRM) objectives. Assuming the proposed reclamation program is successful, the visual contrast would be reduced over time as viewed from each of the three Key Observation Points (KOPs).	The existing visual environment would remain essentially unchanged in the short term; however, Homestake would continue to reclaim surface disturbances associated with the currently permitted mine area.
Noise and Blasting Vibrations	Noise from operations at the mine would be perceptible at nearby sensitive receptors but generally would remain below 55 decibels, A-weighted (dBA), equivalent continuous sound level (L_{eq}), the standard for community noise levels. Substantial noise impacts from blasting would not be expected to occur. Based on review of previous blasting studies, and adjusting for the location of the pit expansion area and blasting weights, the potential that any structure in the Eureka area would be damaged as a result of blasting vibration was determined to be less than 1 in 50 million.	The existing noise environment would remain essentially unchanged during ongoing processing and reclamation. No blasting-related impacts would occur as there would be no additional active mining.
Cultural Resources	No known NRHP-eligible sites within the proposed expansion areas would be directly or indirectly affected.	Impacts to cultural resources would not occur since no additional ground-disturbing activities would occur at the mine site.
Native American Traditional Values	Impacts to Native American traditional values are not anticipated as a result of mine development and operation.	Impacts to Native American traditional values are not anticipated from ongoing activities in the existing mine area.
Social and Economic Values	Temporary increases in local construction jobs and longer-term increases in mining sector employment in Eureka County would occur. Labor earnings in those industries would provide an economic stimulus to the local economy. Expenditures made locally by Homestake and its employees and contractors would support increased local private- and public-sector employment in Eureka. Mine expansion would result in higher demand for local housing, increasing housing values and rents, and additional construction. Tax revenues would increase for Eureka County and the school district, as would demands for public services.	Economic opportunities related to the Proposed Action would be foregone, at least temporarily if not permanently, and impacts on public infrastructure and services would not occur. No changes in public sector fiscal conditions would occur.
Hazardous Materials and Solid Waste		
Transportation	There would be a low probability of an accident involving the release of hazardous materials during the life of the mine. The number of chemical or fuel releases potentially occurring is projected at approximately 0.03.	The transport of hazardous materials for the ongoing processing of ore at the existing mine would continue until recovery had been completed. The potential transportation accident/release rate would be slightly lower and shorter in duration than under the Proposed Action.
Storage and Use	Operations would be conducted in accordance with the existing SPCC Plan, which would ensure that impacts from potential spills would be minimized and the spilled materials contained and removed. The existing Emergency Response and Contingency Plan also would assist in minimizing impacts of potential spills of hazardous materials.	Impacts would be the same as described for the Proposed Action.
Environmental Justice	The potential effects would not be expected to disproportionately affect any particular population.	Impacts would be the same as described for the Proposed Action.

3.0 AFFECTED ENVIRONMENT AND ENVIRONMENTAL CONSEQUENCES

This chapter describes the environment that would be affected by the development of the Proposed Action and No Action Alternative. The baseline information summarized in this chapter was obtained from published and unpublished materials; interviews with local, state, and federal agencies; and from field and laboratory studies conducted in the project area. The affected environment for individual resources was delineated based on the area of potential direct and indirect environmental impacts for the proposed expansion. For resources such as soils and vegetation, the affected area was determined to be the physical location and immediate vicinity of the areas to be disturbed by the proposed expansion. For other resources such as water quality, air quality, wildlife, social and economic values, and the transport of hazardous materials, the affected environment was more extensive (e.g., airshed, local communities, etc.).

This chapter also describes the anticipated direct and indirect impacts of the Proposed Action and No Action Alternative as well as potential cumulative impacts. The analysis of potential impacts from the Proposed Action assumed the implementation of the applicant-committed environmental protection measures that would be implemented in association with the proposed expansion (see Section 2.3.14, Applicant-committed Environmental Protection Measures). Mitigation and monitoring developed in response to anticipated impacts are recommended by the BLM for individual resources, as discussed at the end of each resource section. This chapter also identifies residual adverse impacts, which are the impacts that would remain after mitigation measures have been implemented.

The proposed project may result in impacts interrelated with other past, present, and RFFAs in the area. For resources where project-specific impacts are identified, the cumulative impacts associated with the proposed expansion were evaluated together with other interrelated projects. The period of potential cumulative impact is defined as the approximately 7-year life of the project plus 2 years for reclamation.

This chapter is organized by environmental resource. Sections 3.1 through 3.19 describe the existing conditions and potential environmental impacts associated with each resource. The short-term use of the environment relative to the long-term productivity of resources is discussed in Section 3.20. Short-term is defined as the approximately 7-year period of project operations and 2-year period of reclamation. Long-term impacts are defined as impacts that would continue post-reclamation (beyond 9 years). The irreversible or irretrievable commitment of resources is described in Section 3.21.

The BLM's NEPA Handbook (H-1790-1) requires that all EISs address certain Critical Elements of the Human Environment. These critical elements are presented in **Table 3.0-1** along with the location in this chapter where the element is discussed. If the element does not occur within the proposed expansion area and would not be affected, this is indicated in **Table 3.0-1**, and the element is not discussed further in the SEIS. This elimination of nonrelevant issues follows the CEQ guidelines as stated in 40 CFR 1500.4.

Table 3.0-1
Critical Elements of the Human Environment and Other Resources

Resource	Analyzed	Not Analyzed	SEIS Section Number or Rationale for Elimination
Air Quality	x		Section 3.1
Areas of Critical Environmental Concern		x	Would not be affected
Cultural Resources	x		Section 3.15
Drinking Water/Groundwater Quality	x		Section 3.4
Environmental Justice	x		Section 3.19
Floodplains		x	Would not be affected
Hazardous Materials and Solid Waste	x		Section 3.18
Invasive, Non-native Species	x		Section 3.9
Migratory Birds	x		Section 3.10
Native American Religious Concerns	x		Section 3.16
Paleontological Resources	x		Section 3.3
Prime or Unique Farm Land	x		Section 3.5
Special Status Species	x		Sections 3.6 and 3.10
Wetlands and Riparian Zones		x	Would not be affected
Wild and Scenic Rivers		x	Would not be affected
Wild Horses		x	Would not be affected (The proposed project is outside the boundaries of the Fish Creek Herd Management Area.)
Wilderness	x		Section 3.12

3.1 Air Quality

3.1.1 Affected Environment

The air resources study area for direct and indirect impacts and the cumulative impact area include the area within an approximately 7-mile radius of the mine site.

Baseline meteorology, air quality, and dispersion conditions at the project site were characterized from on site data taken during 1997-2002, and from data records from a meteorological station at Eureka. The proposed expansion is located near the east-central portion of the Great Basin. The surrounding terrain consists of alternating mountain ranges and sagebrush-covered valleys, with the mine site situated in the Basin and Range physiographic province. The Diamond Mountains lie north of the mine site with the highest peaks reaching elevations over 10,000 feet amsl. Elevations in the project area range from approximately 6,200 to 6,500 feet amsl.

The climate in the project region is classified as semi-arid to arid with elevations below 6,500 feet amsl receiving the least amount of precipitation, while the mountainous areas are substantially wetter receiving 11 to over 15 inches of precipitation annually. A semi-arid climate is characterized by low rainfall, low humidity, clear skies, and relatively large annual and diurnal temperature ranges (National Oceanographic and Atmospheric Administration 1974).

As a result of the typically dry atmosphere, bright sunny days and clear nights frequently occur. This in turn allows rapid heating of the ground surface during daylight hours and rapid cooling at night. Since heated air rises and cooled air sinks, winds tend to blow uphill during the daytime and downslope at night. This upslope and downslope cycle generally occurs in all the geographical features, including mountain range slopes and river courses. The larger the horizontal extent of the feature, the greater the volume of air that moves in the cycle. Complex terrain features cause cyclic air movement, with thin layers of low level (boundary layer) winds embedded within the larger scale upper wind systems (synoptic winds). Synoptic winds in the region are predominantly west to east, are characterized by daily weather variations which enhance or diminish the boundary layer winds, and are substantially channeled by local topography.

3.1.1.1 Climatology and Meteorology

Three important meteorological factors influence the dispersion of pollutants in the atmosphere: mixing height, wind speed, wind direction, and stability. Mixing height is the height above the ground within which rising warm air from the surface would mix by convection and turbulence. The degree to which pollutants are diluted in this mixed layer is determined by local atmospheric conditions, terrain configuration, and source location. Mixing heights vary diurnally, with local weather systems, and with season. For the project area, the mean annual morning mixing height is estimated to be approximately 300 feet, but during the winter months, the mean morning mixing height is approximately 200 feet (Holzworth 1972). The mean annual afternoon mixing height exceeds 2,600 feet.

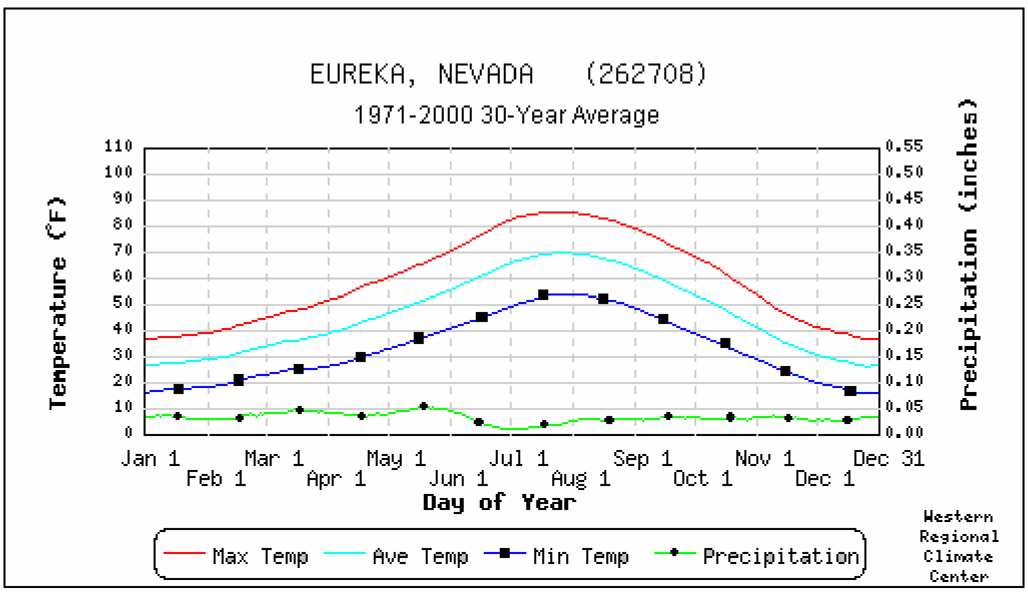
Minimum, maximum, and average temperatures at Eureka are presented in **Table 3.1-1** and **Figure 3.1-1**. Summers are typically hot and dry except in the higher mountain ranges.

Table 3.1-1
Period of Record Monthly Climate Summary
Eureka, Nevada
(10/1/1952 – 3/31/2004)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Average Maximum Temperature (degrees Fahrenheit [°F])	38.1	41.3	48.2	55.9	65.9	76.7	85.7	83.8	74.7	62.9	47.2	39.1	60.0
Average Minimum Temperature (°F)	17.6	19.8	24.2	28.9	36.5	44.2	52.4	51.8	43.6	34.0	24.1	17.8	32.9
Average Total Precipitation (inches)	0.90	1.02	1.30	1.21	1.43	0.88	0.60	0.87	0.85	0.84	0.87	0.96	11.74
Average Total Snowfall (inches)	6.5	5.9	8.3	4.9	2.6	0.1	0.0	0.0	0.4	1.7	5.3	7.4	43.2
Average Snow Depth (inches)	2	1	0	0	0	0	0	0	0	0	0	1	0

Source: Western Regional Climate Center 2004.

Figure 3.1-1
Monthly Temperature and Precipitation
Eureka, Nevada
(1971 – 2000)



Data are smoothed using a 29-day running average.

Note: Maximum temperature is the average of all daily maximum temperatures recorded for the day of the year between the years 1971 and 2000.
Average temperature is the average of all daily average temperatures recorded for the day of the year between the years 1971 and 2000.
Minimum temperature is the average of all daily minimum temperatures recorded for the day of the year between the years 1971 and 2000.
Precipitation is the average of all daily total precipitation recorded for the day of the year between the years 1971 and 2000.

Although precipitation is spread throughout the year, most of the annual precipitation falls as snow during the winter months. The average annual precipitation is approximately 12 inches at Eureka, but it is approximately 13 inches at the mine. Average precipitation totals by month for Eureka are presented in **Table 3.1-1**. Average relative humidity ranges from a low of 17 percent in the summer during the day to a high of 77 percent in spring during the night (National Oceanographic and Atmospheric Administration 1990). Net evaporation exceeds precipitation in the project area.

The proposed expansion is located at a latitude that places it within the belt of prevailing westerly winds that circle the globe around the earth's northern hemisphere. However, the mine site is located in complex terrain where the winds are affected by local topographic features. This is evident in the on site wind data collected at the mine that show predominant winds blowing from the south along the valley parallel to the major mountain ranges. Winds were measured on a 10-meter tower near the proposed expansion area, and an annual wind rose for the monitoring site is shown in **Figure 3.1-2**. These data show the percentage of time that the wind blows from a particular direction. For the project site, the most frequently reported wind direction is from the south.

Wind speed (reported in meters per second [m/s]) has an important effect on area ventilation and the dilution of pollutant concentrations from individual sources. Light winds, in conjunction with large source emissions, may lead to an accumulation of pollutants that can stagnate or move slowly to downwind areas. During stable conditions, downwind usually means down valley or toward lower elevations.

Morning atmospheric conditions tend to be stable because of the cooling of the layers of air nearest the ground. Afternoon conditions, especially during the warmer months, tend to be neutral to unstable because of the heating of the surface under clear skies. During the winter, periods of stable afternoon conditions may persist for several days in the absence of synoptic scale storm systems to generate higher winds with more turbulence and mixing. A high frequency of inversions at lower elevations during the winter can be attributed to the nighttime cooling and sinking air flowing from higher elevations to the low lying areas in the basins. Although winter inversions generally are quite shallow, they tend to be more stable because of reduced surface heating. The existing mine site is located at higher elevations and would experience fewer episodes with stagnant conditions than locations in lower valleys.

3.1.1.2 Air Quality

Air quality is defined by the concentration of various pollutants and their interactions in the atmosphere. Pollution effects on receptors have been used to establish a definition of air quality. Measurement of pollutants in the atmosphere is expressed in units of parts per million (ppm) or micrograms per cubic meter ($\mu g/m^3$). Both long-term climatic factors and short-term weather fluctuations are considered part of the air quality resource, because they control dispersion and affect concentrations. Physical effects of air quality depend on the characteristics of the receptors and the type, amount, and duration of exposure. Air quality standards specify acceptable upper limits of pollutant concentrations and duration of exposure. Air pollutant concentrations within the standards generally are not considered to be detrimental to public health and welfare.

The relative importance of pollutant concentrations can be determined by comparison with an appropriate national and/or state AAQS. National and state AAQS are presented in **Table 3.1-2**. These are the standards applicable to Hydrographic Basin 154 that encompasses the project area. An area is designated by the U.S. Environmental Protection Agency (USEPA) as being in attainment for a pollutant if ambient concentrations of that pollutant are below the National Ambient Air Quality Standards (NAAQS). An area is not in attainment if violations of NAAQS for that pollutant occur. Areas where insufficient data are available to make an attainment status designation are listed as unclassifiable and are treated as being in attainment for regulatory purposes.

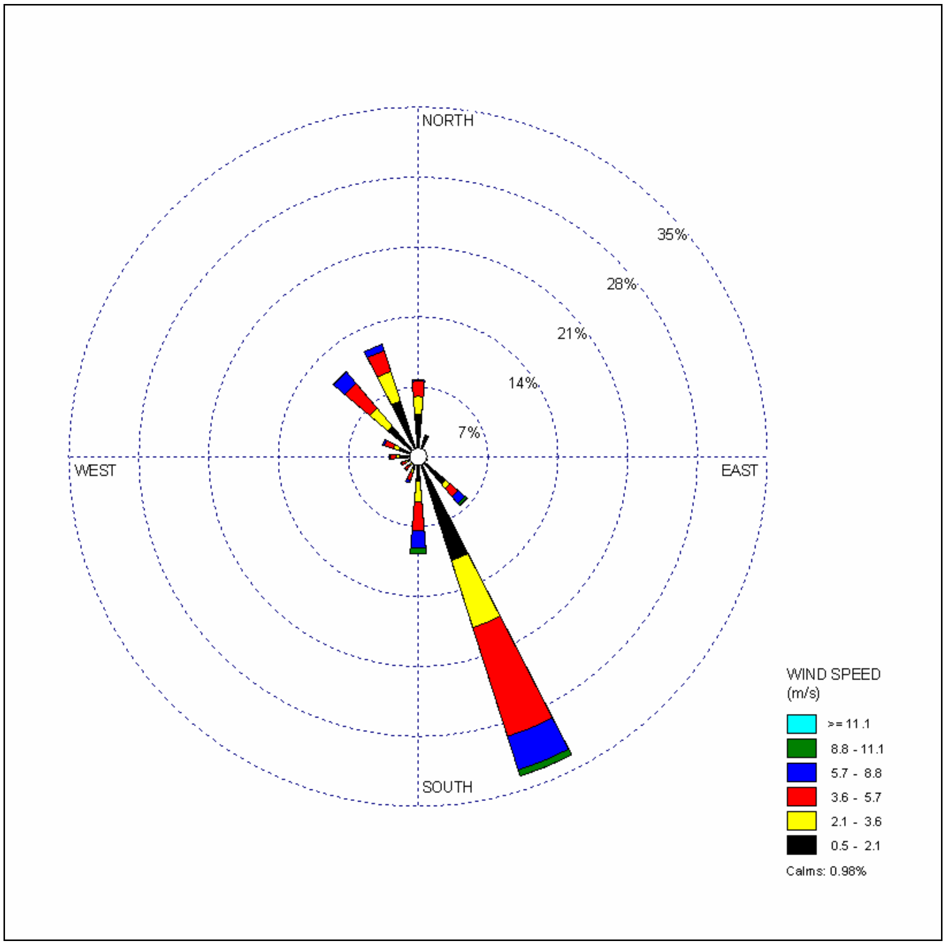


Figure 3.1-2 Annual Wind Rose Ruby Hill Mine

Table 3.1-2
Ambient Air Quality Standards

Pollutant	Averaging Time	Nevada Standards[1]	National Standards[2]	
			Primary[3,4]	Secondary[3,5]
Ozone	1 hour	0.12 ppm (235 μg/m^3)	0.12 ppm (235 μg/m^3)	Same as primary
Ozone-Lake Tahoe Basin, #90	1 hour	0.10 ppm (195 μg/m^3)	--	--
Ozone	8 hours	0.08 ppm (157 μg/m^3)	0.08 ppm (157 μg/m^3)	Same as primary
CO less than 5,000 feet amsl	8 hours	9 ppm (10,000 μg/m^3)	9 ppm (10,000 μg/m^3)	None
CO at or greater than 5,000 feet amsl		6 ppm (6,670 μg/m^3)		
CO at any elevation	1 hour	35 ppm (40,000 μg/m^3)	35 ppm (40,000 μg/m^3)	
NO_2	Annual arithmetic mean	0.053 ppm (100 μg/m^3)	0.053 ppm (100 μg/m^3)	Same as primary
SO_2	Annual arithmetic mean	0.03 ppm (80 μg/m^3)	0.03 ppm (80 μg/m^3)	None
	24 hours	0.14 ppm (365 μg/m^3)	0.14 ppm (365 μg/m^3)	
	3 hours	0.5 ppm (1,300 μg/m^3)	None	0.5 ppm (1,300 μg/m^3)
PM_{10}[3]	Annual arithmetic mean	50 μg/m^3	50 μg/m^3	Same as primary
	24 hours	150 μg/m^3	150 μg/m^3	Same as primary
Particulate matter with an aerodynamic diameter of 2.5 microns or less ($PM_{2.5}$)[3]	Annual arithmetic mean	15 μg/m^3	15 μg/m^3	Same as primary
	24 hours	65 μg/m^3	65 μg/m^3	
Lead	Quarterly arithmetic mean	1.5 μg/m^3	1.5 μg/m^3	Same as primary
Visibility	Observation	In sufficient amount to reduce the prevailing visibility[6] to less than 30 miles when humidity is less than 70 percent	--	--
Hydrogen sulfide	1 hour	0.08 ppm (112 μg/m^3)[7]	--	--

[1] These standards must not be exceeded in areas where the general public has access.
[2] These standards, other than for ozone, particulate matter, and those based on annual averages, must not be exceeded more than once per year. The 1-hour ozone standard is attained when the expected number of days per calendar year with a maximum hourly average concentration above the standard is equal to or less than one. The PM_{10} 24-hour standard is attained when the expected number of days per calendar year with a 24-hour average concentration above the standard, rounded to the nearest 10 μg/m^3, is equal to or less than one. The expected number of days per calendar year generally is based on an average of the number of times the standard has been exceeded per year for the last 3 years.
[3] Where applicable, concentration is expressed first in units in which it was adopted. All measurements of air quality that are expressed as mass per unit volume, such as μg/m^3, must be corrected to a reference temperature of 25 degrees Celsius and a reference pressure of 760 millimeters of mercury (1,013.2 millibars); ppm in this table refers to ppm by volume, or micromoles of regulated air pollutant per mole of gas.
[4] National primary standards are the levels of air quality necessary, with an adequate margin of safety, to protect the public health.
[5] National secondary standards are the levels of air quality necessary to protect the public welfare from any known or anticipated adverse effects of a regulated air pollutant.
[6] For the purposes of this section, prevailing visibility means the greatest visibility which is attained or surpassed around at least half of the horizon circle, but not necessarily in continuous sectors.
[7] The ambient air quality standard for hydrogen sulfide does not include naturally occurring background concentrations.

Source: Nevada Administrative Code NAC 445B.22097 Standards of Quality for Ambient Air (Nevada Revised Statute 445B.210, 445B.300).

The existing air quality of the project area is typical of the largely undeveloped regions of the western U.S. For the purposes of statewide regulatory planning, this area has been designated as in attainment for all pollutants that have an AAQS.

Particulate Matter

Table 3.1-3 summarizes particulate matter concentrations collected during 1997 to 2002 at the existing Ruby Hill Mine site. The monitoring site is located near the Eureka High School, immediately adjacent to an unpaved public road that is a potential source of fugitive dust. The PM_{10} monitors were audited and calibrated on a quarterly basis with data reported to NDEP. A summary of nearly 5 years of monitoring data is provided in **Table 3.1-3**. There were two dates on which the PM_{10} values exceeded the 24-hour standard of 150 μg/m^3, September 9, 1999, and July 13, 2002. In both cases, meteorological data from the site indicate no strong wind from the direction of the mine and no unusual activity at the mine itself. Both cases occurred during the summer months when the area is dry and hot. The road near the monitoring site is unpaved and used frequently. As a result, the road can be very dusty. The NDEP reviewed the data and concluded that these exceedances were most likely caused by outside sources and not the mine. Air quality regulations allow one exceedance of the 24-hour PM_{10} standard during a calendar year. Annual average concentrations did not exceed the NAAQS standard of 50 μg/m^3 at any time during the nearly 5-year monitoring period.

The maximum annual value, based on the arithmetic average of all four quarters in 2001, was 27.8 μg/m^3, which is less than the Nevada State and federal annual arithmetic mean particulate matter standard of 50 μg/m^3.

Table 3.1-3
Summary of Particulate Matter Measurements
Ruby Hill Mine Site 1997-2002
(μg/m^3)

Year	Primary 24-hour 1st High	Collocated 24-hour 1st High	Primary 24-hour 2nd High	Collocated 24-hour 2nd High	Primary Annual Average	Collocated Annual Average
1997	52	51	34	34	20.9	20.2
1998	79	75	45	48	18.7	18.7
1999	194	180	55	54	21.6	19.8
2000	46	43	42	43	16.6	16.0
2001	131	130	72	73	27.8	27.5
2002	214	212	60	56	26.8	26.2

Mercury

Mercury in the atmosphere occurs almost exclusively as gaseous mercury. Oxidized forms and methylmercury typically constitute less than 2 percent of the total concentration in air. However, virtually all of the deposition is in the oxidized forms (Fitzgerald et al. 1991). Historically, scientists have had little information about temporal trends in the atmosphere and treat mercury as if it were at steady state, cycling through the atmosphere with approximately a 1-year residence time (Fitzgerald 1986, 1989). For the mercury mass balance, the total mass of mercury in the atmosphere has been estimated at 5,000 to 6,000 metric tons (Fitzgerald 1986, 1989; Slemr et al. 1985). Fitzgerald (1986, 1989) provides extensive data that place mercury deposition at approximately 6,000 metric tons per year.

Less extensive data on the major source categories for input to the atmosphere exist. Fitzgerald (1986) estimated that approximately 2,000 metric tons entered the atmosphere from the ocean surface, approximately the same amount from man-made sources, and the remainder from land surfaces. In round numbers, approximately one-third of the mercury input to the atmosphere comes from each of the three categories, ocean, land, and man-made. Other authors suggest that anthropogenic sources may be as much as half of the total input, reducing the land evasion of mercury to approximately 1,000 metric tons.

Nriagu and Pacnya (1988) estimate that, on a global basis, approximately 1,500 metric tons of mercury emissions per year are produced by combustion of fossil fuels. Of this, approximately 300 metric tons are produced for electrical generation and 1,200 metric tons are from other industrial use. Waste incineration produces approximately 600 metric tons per year and smelting and wood combustion produce approximately 250 metric tons.

Mercury emissions to the atmosphere come from both background (ocean and land) and man-made sources. Background sources of mercury include natural sources such as volcanoes and emissions from abandoned mining operations. Man-made sources include both global and local sources of mercury. The fate of mercury emissions follows a progression from the emission source to transport, deposition, exposure, and potential human risks. From a single source such as a power plant or a mine, approximately 20 percent of the emissions are deposited locally near the source, while the remaining portion of the mercury is dispersed regionally and even globally. The final pathway to humans for mercury exposure is through the eating of fish with methylmercury stored in their flesh. Approximately 0.3 percent of the total mercury emitted from a point source is deposited in lakes and streams to form a methlymercury compound ***(Porcella 1994)***.

Speciation of mercury is important in understanding the health impacts of mercury in the environment. Gaseous mercury must be transformed to particulate oxidized mercury to contribute substantially to the mercury deposition and subsequent entry into water bodies where further transformation to methylmercury makes the mercury available in the aquatic food chain (Porcella 1994).

3.1.2 Environmental Consequences

3.1.2.1 Proposed Action

Construction, mining, and ore processing activities associated with the proposed mine expansion would be a source of both total suspended particulates and PM_{10}. Ore processing operations and gasoline and diesel-powered vehicles and equipment would be sources of gaseous pollutants such as SO_2, NO_2, CO, and volatile organic compounds (VOCs).

The air quality impact of a fugitive dust source depends on the quantity and drift potential of the dust particles released into the atmosphere. The larger dust particles settle out near the source, while fine particles are dispersed over much greater distances. Theoretical drift distances, as a function of particulate diameter and mean wind speed, have been computed for fugitive dust emissions. For a typical wind speed of 10 miles per hour (mph), particles larger than 100 micrometers (μm) are likely to settle out within 20 to 30 feet from the source. (For comparison, a human hair has a thickness of approximately 100 μm.) Particles 30 to 100 μm, depending on the extent of atmospheric turbulence, are likely to settle out within a few hundred feet. Dust particles smaller than 30 μm generally are recognized as emissions that may remain suspended indefinitely.

Air quality in the study area would be affected by both construction and operation of mining facilities. Reclamation activities also would cause an increase in fugitive and gaseous emissions in the local area. Construction would result in temporary air quality impacts due to increases in local fugitive dust levels. Dust generated from these open sources is termed "fugitive" because it is not discharged to the atmosphere in a confined flow stream (e.g., stack, chimney, or vent). The principal sources of fugitive dust would be related to construction activities, including land clearing, earth moving, scraping, hauling, and materials storage and handling; drilling and blasting; truck loading operations; wind erosion from stockpiles; and ore handling operations. In addition, other fugitive emissions impacts would be caused by mud/dirt carry-out onto paved surfaces. The additional surface loading would cause an increase in fugitive emissions during the life of the construction phase.

During construction, operation, and reclamation, vehicle exhaust emissions would be generated, but such emissions would be small compared to fugitive emissions from earth moving, hauling, and other construction activities and would not affect regional air quality. Particulate levels from construction, operation, and reclamation activities would vary, and impacts would depend on the activity location and the daily wind and weather. These activities would require a surface disturbance permit from NDEP, which would require that watering or other measures be implemented to limit fugitive dust emissions. While measures such as watering would reduce the amount of emissions from such activities, some level of fugitive dust emissions would be unavoidable due to the nature of the work. Although some impacts on air quality inevitably would occur during construction and reclamation, they would be transitory and temporary, limited in duration, and would end at the completion of that particular phase of the work. Once reclamation has been completed, pollutant concentrations would return to background levels.

Air quality impacts due to emissions from mining operations would occur throughout the operational phase of the project. The primary pollutant would be fugitive dust particulates (total suspended particulates and PM_{10}) generated by the mining operations, crushers, screens, conveyors, and other processes. Other pollutants would include NO_2, CO, and SO_2 from exhaust emissions from the electrical generators, vehicles, and other fuel burning equipment. VOCs would be emitted from fuel storage tanks. All individual criteria pollutant emission rates would be less than 250 tons per year; therefore, the proposed mine expansion would not be a "major stationary source" as defined by the USEPA. Air pollutant sources are deemed "major" for PSD purposes if their emissions of any criteria pollutant exceed 250 tons per year.

Sources of fugitive dust and other pollutants would include:

- Primary, secondary, and tertiary crushers
- Conveyors and stackers
- Screens
- Blasting

- Lime or cement silo loading and unloading
- Bullion furnace and carbon reactivation kiln
- Truck loading and dumping
- Diesel generators
- Overburden and ore stockpiles
- Paved and unpaved roads

Fugitive dust emissions may be generated by wind erosion of open aggregate storage piles and exposed areas within an industrial facility. These sources typically are characterized by non-homogeneous surfaces impregnated with non-erodible elements (particles larger than approximately 1 centimeter in diameter). Field testing of aggregate piles and other exposed materials using a portable wind tunnel has shown that: 1) threshold wind speeds exceed 5 m/s (11 mph) at 15 centimeters above the surface or 10 m/s (22 mph) at 7 meters above the surface, and 2) particulate emission rates tend to decay rapidly (half-life of a few minutes) during an erosion event (USEPA 1995). In other words, these aggregate material surfaces are characterized by a finite availability of erodible material (mass/area) referred to as the erosion potential. Any natural crusting of the surface binds the erodible material, thereby reducing the erosion potential.

Emissions generated by wind erosion also are dependent on the frequency of disturbance of the erodible surface, because each time a surface is disturbed, its erosion potential is restored. A disturbance is defined as an action that results in the exposure of fresh surface material. On a storage pile, this would occur whenever aggregate material is either added to or removed from the old surface. A disturbance of an exposed area also may result from the turning of surface material to a depth exceeding the size of the largest pieces of material present.

The emission factor for wind-generated particulate emissions from mixtures of erodible and non-erodible surface material subject to disturbance may be expressed in units of tons per acre per year or other appropriate units. In calculating emission factors, each area of an erodible surface that is subject to a different frequency of disturbance is treated separately. For a surface disturbed daily, N = 365 per year, and for a surface disturbance once every 6 months, N = 2 per year.

The air quality impact analysis was conducted for the proposed mine expansion using the Industrial Source Complex (ISC3) dispersion model. ISC3 is a USEPA- and NDEP-approved air quality dispersion modeling method for integrating the modeling results in the three terrain zones of simple terrain, intermediate terrain, and complex terrain. A summary of predicted air emissions from the mine is shown in **Table 3.1-4**.

Table 3.1-4
Summary of Air Emissions
(tons per year)

Pollutant	Proposed Action
NO_2	0.58
CO	0.08
Total Organic Compounds	0.02
PM_{10} (Point Sources)	53.9
PM_{10} (Fugitive Sources)	***93.8***

On site meteorological data for 2 years, 2000 and 2002, were used in the dispersion modeling. Results from modeling the mine sources show that maximum concentrations of NO_2, CO, SO_2, and PM_{10} would not exceed Nevada or National AAQS (**Table 3.1-5**). Modeling studies show that maximum 24-hour PM_{10} concentrations including background are 41.9 (2000) and 35.3 (2002) μg/m^3 at the eastern fenceline and that annual concentrations of PM_{10} are 11.1 (2000) and 11.0 (2002) μg/m^3 also at the eastern fenceline. Background levels of PM_{10} of 10.2 (24-hour) and 9.0 (annual) μg/m^3 were added to the incident levels determined from modeling. Based on these results, process and fugitive dust emissions from the facilities would be below the 250 tons per year threshold requiring a PSD permit. Based on the results of the existing on site monitoring data and the modeling results, it is assumed that the project would comply with all existing air quality standards in Nevada. In addition, Homestake would continue to implement fugitive dust control measures and monitor ambient particulate concentrations at the mine site in accordance with permit requirements as discussed in Section 2.3.14, Applicant-committed Environmental Protection Measures. Also, air quality permits issued by the NDEP would require Homestake to control emissions, including fugitive emissions, from sources at the mine site due to mining activities. Homestake would apply all air pollution controls specified in its air quality permit to reduce emissions during construction and operation of the mine.

Table 3.1-5
PM_{10} Modeling Results
(μg/m^3)

	Project Fence Line	Eureka High School	Eureka County Fairgrounds
24-hour Concentration	31.7	6.7	6.3
Background	10.2	10.2	10.2
Total 24-hour Concentration	41.9	16.9	16.5
24-hour Standard	150	150	150
Annual Concentration	2.1	0.8	0.6
Background	9.0	9.0	9.0
Total Annual	11.1	9.8	9.6
Annual Standard	50	50	50

Particulate mercury is present naturally in the soils, overburden, and ore at the mine; therefore, mercury would be present as a small fraction of all particulate emissions produced during the various mine processes. Material handling; primary, secondary and tertiary crushing; conveying; and stacking are potential emission sources of particulate mercury. Controls would be applied to each of the processes to reduce overall particulate emissions. Mercury emissions from fugitive dust at the mine were estimated using an emission factor of 4.70E^{-05} tons per ton of PM_{10} emissions (BLM 1997a). Using this emission factor, total particulate mercury emissions are calculated to be 2.47E^{-03} tons per year (less than 5 pounds). ***Point source mercury emissions at the Ruby Hill Mine (primarily the refinery and carbon kiln) are, and would continue to be, controlled by wet scrubbers and a retort condenser. Reported particulate mercury emissions during the last full year of operation (2000 Ruby Hill Mine TRI Annual Report) were less than 1 pound.*** The Ruby Hill Mine air quality permit issued by NDEP limits the throughput in the retort system.

There would be no air quality impacts on Class I areas. There are no Class I areas within 100 kilometers of the proposed mine expansion.

3.1.2.2 No Action Alternative

Under the No Action Alternative, the proposed mine expansion would not be developed, and related air quality impacts would not occur. Impacts to air quality under this alternative would be limited to ongoing mineral processing and reclamation activities and would be localized.

3.1.3 Cumulative Impacts

The cumulative impact area for air quality is shown in **Figure 3.1-3**. Interrelated projects are identified in **Table 2-9**. Cumulative impacts to air quality would include impacts from the proposed mine expansion emission sources, including existing mining operations and fugitive dust, impacts from any reclaimed areas at nearby mine sites, and impacts from background emission sources (e.g., natural background from windblown dust, agricultural activities, and public traffic on unpaved roads in the region).

As stated previously, air impacts from mining operations tend to be localized in the vicinity of the source. The geographic extent of impacts is therefore small. For the Proposed Action, the maximum extent of impacts greater than 1 $\mu g/m^3$ generally would be less than approximately 10 kilometers (6.2 miles) from the mine boundary. Even nearby sources would have only limited overlap with impacts from the Ruby Hill Mine site. Since the Ruby Hill Mine site would be the largest permitted air emission source in the immediate vicinity, its impacts could dominate any cumulative impacts to air quality.

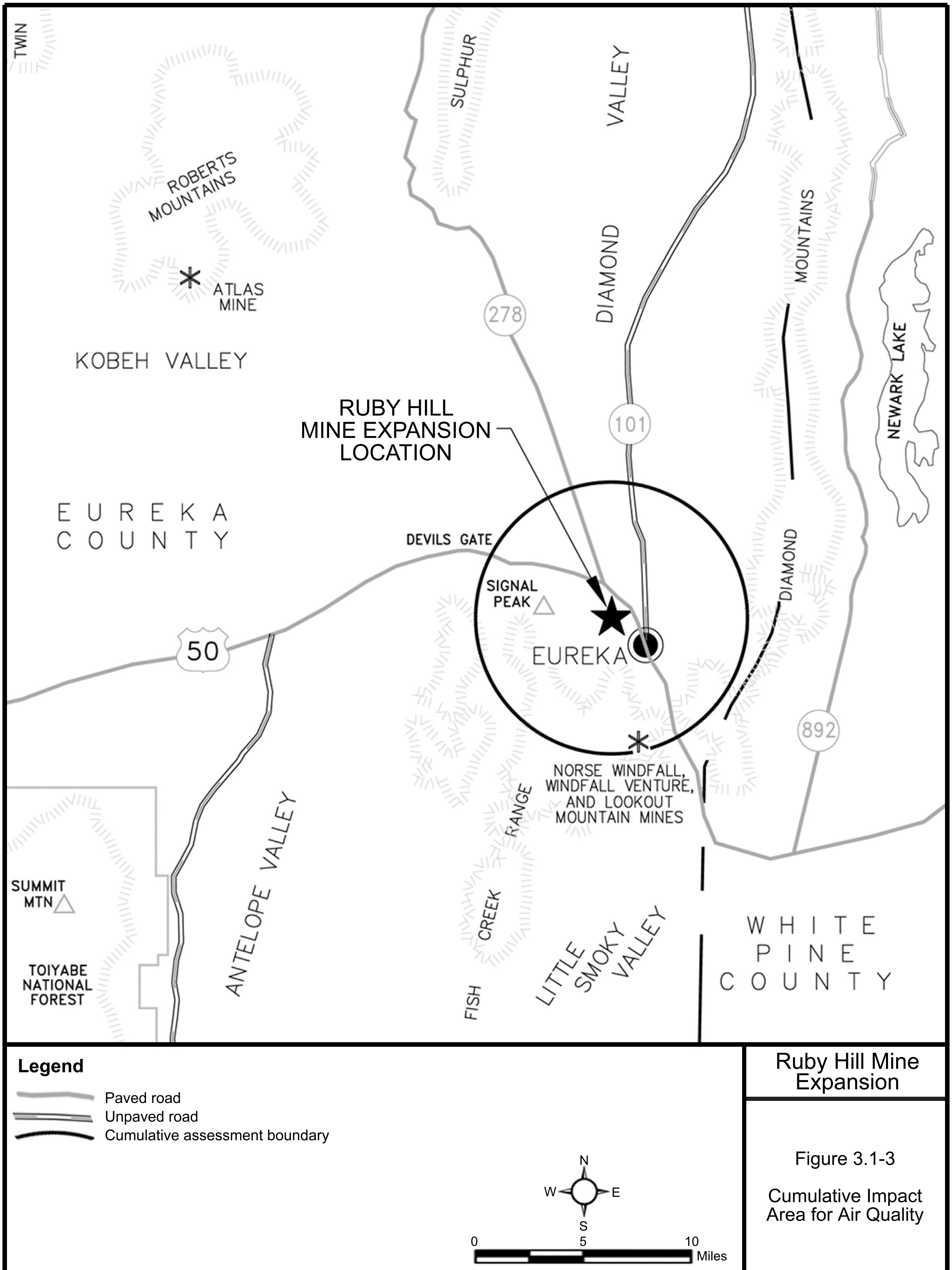
Cumulative impacts from existing operations at the Ruby Hill Mine already are reflected in the measured particulate levels at the site. Modeling results shown in **Table 3.1-5** confirm that when impacts from the existing mine operations and from other mines in the area are added to the new impacts from the Proposed Action, the resultant cumulative impacts would be well below state and federal AAQS.

3.1.4 Mitigation and Monitoring

No additional monitoring or mitigation measures have been identified as no adverse impacts to air quality would be anticipated as a result of the proposed mine expansion.

3.1.5 Residual Adverse Impacts

There would be no residual adverse impacts to air quality from the proposed mine expansion, since reclamation and revegetation would stabilize exposed soil and control fugitive dust emissions. As vegetation becomes established, particulate levels should return to what is typical for a dry desert environment. Once the disturbance ceases and wind erodible surfaces are reclaimed, air resources would return to the pre-mining condition.



Ruby Hill Mine Expansion

Figure 3.1-3

Cumulative Impact Area for Air Quality

01/07/05

3.2 Geology and Minerals

3.2.1 Affected Environment

This section addresses the topography, regional geology, bedrock geology, surficial deposits, seismicity, geologic hazards, and mineral resources for the Ruby Hill Mine Expansion – East Archimedes Project. The geologic elements discussed below also provide background information for the characterization of the hydrogeologic conditions presented in Section 3.4, Water Quality and Quantity.

The geology and minerals study area for direct and indirect impacts is the existing Ruby Hill Mine study area, which includes the proposed mine expansion areas. The cumulative impact area includes Homestake's ongoing mineral exploration area within and adjacent to the existing Ruby Hill Mine.

3.2.1.1 Physiographic and Topographic Setting

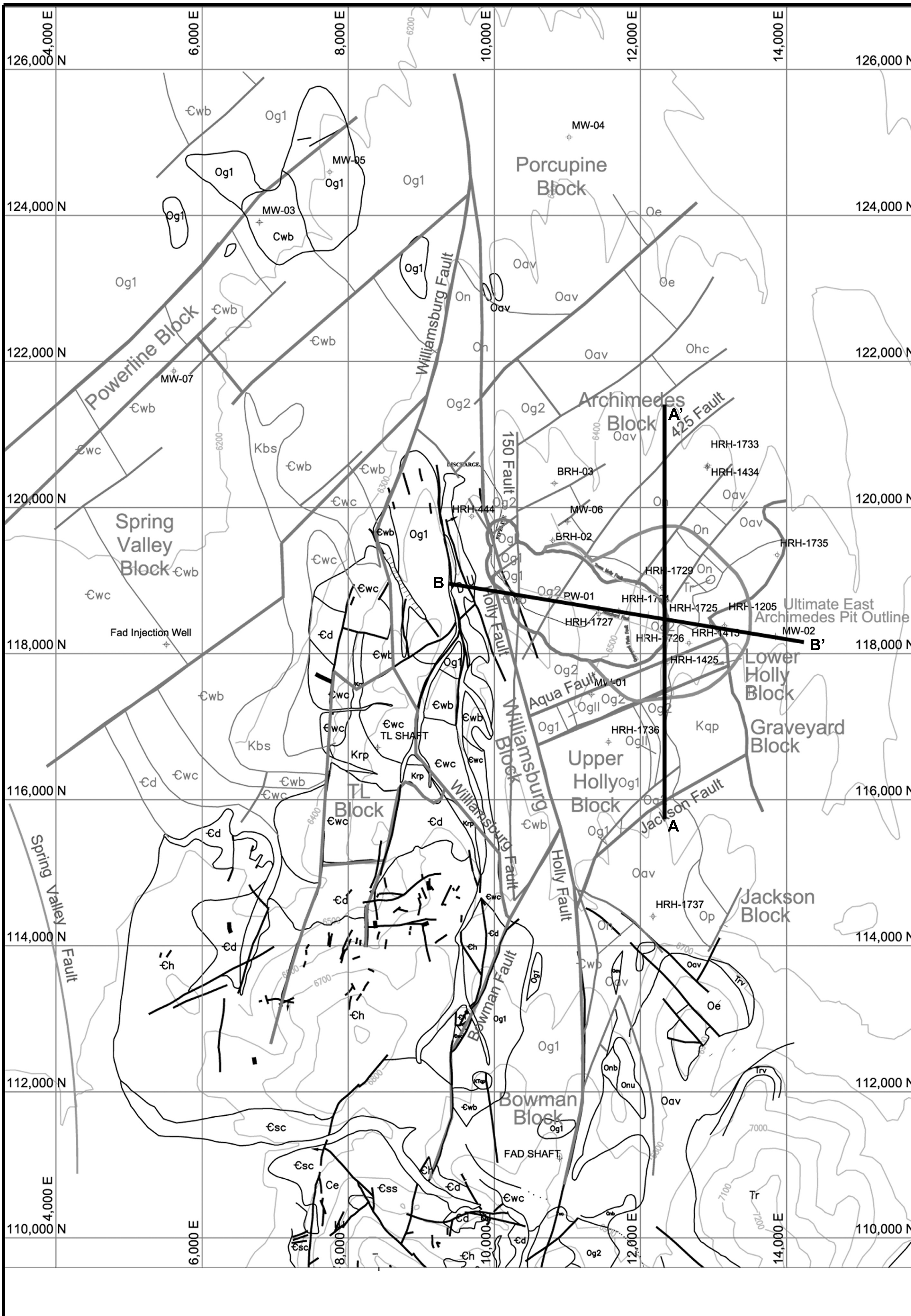
The project area is located at the northern end of Prospect Ridge, which forms the northern end of the Fish Creek Range, in the Basin and Range Province of Nevada. The Basin and Range Province is characterized by a series of generally north-trending mountain ranges separated by broad basins. This physiography developed from extension-related faulting that was initiated approximately 45 to 20 million years ago and is ongoing (Prowley and Dixon 2001). The ranges are uplifted fault blocks that consist chiefly of sedimentary rocks and volcanic rocks. The basins contain sedimentary deposits that primarily were derived from the erosion of adjacent bounding mountain ranges. These valley fill deposits can be thousands of feet thick in the centers of the basins and consist of alluvial fans, dunes, and lakebed deposits.

Mountains and rolling hills dominate the area; the site of the proposed expansion is situated on gently sloping alluvial fans leading into Diamond Valley.

3.2.1.2 Regional Geologic Setting

A generalized geologic map of the mine site vicinity is shown in **Figure 3.2-1** and is based on a map from a hydrogeologic report by Water Management Consultants (WMC) (2004). The rocks in the area include Cambrian to Cretaceous-age clastic and carbonate sedimentary rocks; Cretaceous and Tertiary-age granitic rocks; Tertiary volcanic rocks; and Quaternary-age alluvial and playa deposits. **Table 3.2-1** provides descriptions and relative ages of the rocks in the region and the project area.

The Cambrian to Permian-age sedimentary rocks are largely composed of a sequence of Cambrian to early Mississippian-age rocks called the Eastern Carbonate Assemblage (Roberts et al. 1967). The Eastern Carbonate Assemblage is approximately 14,000 feet thick in the Eureka area and is approximately 90 percent carbonate rock, 8 percent shale, and 2 percent quartzite. Carbonate formations in the assemblage that host important economic deposits in the area include the Eldorado Dolomite and the Hamburg Dolomite (which are largely mined out), and units of the Pogonip Group, which host the Archimedes deposit.



Legend

BRH-3	Well name
	Interpreted hydrologic block boundary
Porcupine	Hydrologic block name
	Fault
	Contact
Og1	Geologic unit
	Inferred subsurface fault
	Inferred subsurface contact
Kbs	Inferred subsurface geologic unit

Source: WMC 2004.

Qal - Quaternary alluvium
Tr - Rhyolite
Tv - Tertiary volcanic tuff
Kqp - Tertiary quartz porphyry
Kbs - Bullwhacker Sill
Oe - Eureka Quartzite
Op - Pogonip Group
Oav - Antelope Valley Formation
On - Ninemile Formation
Og_u - Goodwin Formation
Og2 - Middle unit
Ogll - Lower laminated unit
Og1 - Basal unit

Cw - Windfall Formation
Cwb - Bullwhacker Member
Cwc - Catlin Member
Cd - Dunderberg Shale
Ch - Hamburg Dolomite
Csc - Secret Canyon Formatic
Css - Lower Shale Member
Cg - Geddes Limestone
Pre-pumping water elev

N S E W
0 6 Miles

Ruby Hill Mine Expansion

Figure 3.2-1

General Site Geology, Hydrologic Blocks, Major Faults, and Monitoring Well Locations

02/02/05

ERA	SERIES	TIME (Ma)		NAME	THICKNESS (feet)	LITHOLOGIC CHARACTER
CENOZOIC	Quaternary			Alluvium	0–500±	Stream and slope alluvium, terrace gravels, and mine and smelter dumps
				Unconformity		
	Late Tertiary or Quaternary			Pyroxene andesite and basalt	700+	Lava flows; a few dikes and small plugs.
				Intrusive contact and unconformity		
	Oligocene or Miocene			Rhyolite tuff	400±	White, layered tuff.
				Rhyolite	100± of flows exp.	Chiefly intrusive plug, dikes, and breccia pipes; vitrophyre sill; and local lava flows.
	Eocene			Hornblende andesite	300± of flows exp.	Dike and lava flows.
		65				
MESOZOIC	Late Cretaceous			Quartz porphyry	-------	Sills and dikes
				Quartz diorite	-------	Intrusive plug south of Ruby Hill.
				Intrusive contact		
	Early Cretaceous			Newark Canyon Formation	200±	Fresh-water conglomerate, sandstone grit, shale, and limestone
		225		Unconformity		
PALEOZOIC	Permian			Carbon Ridge Formation	1,000±	Thin-bedded sandy and silty limestone; some included sandstone and dark shale.
				Unconformity-Ely Limestone absent		
	Late Mississippian			Diamond Peak Formation	0–300	Conglomerate, limestone, and sandstone.
				Chainman Shale	500±exp.	Black shale with thin interbedded sandstone
				Break in section		
	Middle and Late Devonian			Devils Gate Limestone	500± exposed	Thick-bedded limestone, locally dolomitized.
				Break in section-Nevada, Lone Mountain, and Roberts Mountains Formations not recognized in mapped area		
	Late Ordovician			Hanson Creek Formation	300±exp.	Dark-gray to black dolomite.
				Unconformity?		
	Middle to Late (?) Ordovician			Eureka Quartzite	300±	Thick-bedded vitreous quartzite.
				Unconformity		
	Early and Middle Ordovician			Pogonip Group	1,600–1,830	Chiefly cherty thick-bedded limestone at top and bottom; thinner bedded shaly limestone in middle.
	Late Cambrian			Windfall Formation: Bullwhacker Member	400	Thin-bedded sandy limestone.
				Windfall Formation: Catlin Member	250	Interbedded massive limestone, some cherty, and thin sandy limestone.
				Dunberberg Shale	265	Fissle brown shale with interbedded thin nodular limestone.
	Middle and Late Cambrian			Hamburg Dolomite	1,000	Massively bedded dolomite; some limestone at base.
	Middle Cambrian			Secret Canyon Shale: Clarks Spring Member	425–450	Thin-bedded platy and silty limestone, with yellow or red argillaceous partings.
				Secret Canyon Shale: Lower Shale Member	200–225	Fissle shale at surface; green siltstone underground.
				Geddes Limestone	330	Dark-blue to black limestone; beds 3–12 in. thick; some black chert.
				Eldorado Dolomite	2,500±	Massive gray to dark dolomite; some limestone at or near base.
	Early Cambrian			Pioche Shale	400–500	Micaceous khaki-colored shale; some interbedded sandstone and limestone
				Prospect Mountaine Quartzite (base not exposed)	1,700+	Fractured gray quartzite weathering pink or brown; a few thin interbeds of shale.
		570				

Source: Nolan 1962.

Ruby Hill Mine Expansion

Table 3.2-1

Stratigraphic Column
Eureka Mining District

Late Mississippian and Permian-age rocks in the project area are part of the Overlap Assemblage (Roberts et al. 1967) and include the Diamond Peak Formation (late Mississippian) and the Carbon Ridge Formation (Permian).

The Newark Canyon Formation is Cretaceous and regionally is composed of fresh-water deposited limestone and conglomerate. Although only 200 feet thick in the project area, it can be as much as 4,000 feet thick (Roberts et al. 1967).

Cretaceous to Tertiary-age granitic rocks in the area include a large granitic pluton at Whistler Mountain northwest of the project area and a small pod of intrusive rocks in the Diamond Range. Granitic rocks also are located near the Ruby Hill project area. Cretaceous-age quartz diorite (dated at approximately 106 million years ago) crops out south of Ruby Hill; this body appears genetically related to the rich replacement ores mined in the previous century (Shawe and Nolan 1989). A large quartz feldspar porphyry intrusive body is present in the subsurface east of the West Archimedes deposit. WMC (2004) refers to this body as the Graveyard Flat Intrusive; it is Cretaceous in age. Rocks of similar age and composition are found in sills that are present beneath the deposit, but also are exposed on Mineral Point to the west of the deposit. WMC (2004) refers to the sills collectively as the Bullwacker sill.

Tertiary-age volcanic rocks present in the area include older rhyolite tuffs and intrusives and younger ash flows, lamprophyre dikes, and basaltic andesite lavas and intrusives. Age determinations for the older group range from 39 to 34 million years ago, whereas the younger group is 23 to 21 million years ago (Shawe and Nolan 1989). These rocks are found in the valleys and usually are covered by Quaternary-age gravel and alluvium.

Quaternary-age sedimentary deposits were derived from erosion of the surrounding mountains. The earlier Pleistocene deposits are composed of alluvial fans, slope wash, and talus. Later Pleistocene and Holocene (Recent) deposits contain less slope wash and alluvial fan deposits and more fluvial and channel deposits. Silt and clay playa deposits are the most recent deposits in Diamond Valley (Nolan 1962). Alluvial deposits are as much as 7,500 feet thick in the center of Diamond Valley (Harrill and Lamke 1968), but in the project area, the deposits typically range from 0 to 750 feet thick.

The geologic structure in the area is very complex. Older rocks are affected by both Mississippian- and Mesozoic-age deformation, which produced imbricate thrust sheets and related folds and high-angle faults. Present topography resulted from Basin and Range faulting that has overprinted or segmented structural blocks created by previous tectonic activity. Major fault zones of the region are shown in **Figure 3.2-1**; these faults have aided in recognition of distinct structural domains or blocks. The project area and the historic Ruby Hill deposits are located in a block in which the rocks have been folded and faulted (Nolan 1962). The block is bounded on the west by the Spring Valley fault, which accounts for several thousand feet of Pleistocene- and late Tertiary-age motion. This fault, along with the eastern branches of the Jackson-Lawton fault zone, are largely responsible for uplift and the present relief of the Prospect Ridge block.

Mineral deposits in the Eureka Mining District primarily are confined to a few stratigraphic units (Roberts et al. 1967). The Eldorado Dolomite hosts the rich gold, silver, and lead replacement deposits mined at Ruby Hill in the previous century, as well as the deep Fad resource defined and partly developed, but not mined, during the period from 1940 to 1965. The Hamburg Dolomite hosts the T.L. ore body southwest of the Archimedes deposit and a group of deposits farther south in the district, including the Windfall and Ratto Canyon ore bodies. Pogonip Group rock, especially the upper portion of the Goodwin Limestone, hosts most of the West Archimedes gold deposit. Carbonate rocks of the Windfall Formation host a few district deposits, including the Holly replacement ores mined from 1915 to 1927. All mineralization in the district is believed to be related either to Cretaceous-age intrusive bodies or to Tertiary-age hydrothermal activity.

3.2.1.3 General Site Geology

Stratigraphy

The general site geology is illustrated in **Figure 3.2-1**. The stratigraphy in the immediate project area includes most of the major rock types listed in **Table 3.2-1**. Cambrian rocks and the granitic plutons exposed on Prospect Ridge to the southwest would not be exposed by the proposed pit expansion. The Quaternary Alluvium, Volcanic Tuff, Cretaceous Quartz Porphyry, and Pogonip Group rocks would be affected by the Proposed Action. The ore associated with the proposed pit expansion primarily would come from the Goodwin Limestone of the Pogonip Group (WMC 2004). The overlying alluvium has a varying thickness and would be removed as overburden. Most of the proposed project components, including the pit, waste rock disposal areas, and heap leach expansions, would be located on alluvium, which is part of extensive alluvial fan deposits on the margins of the Fish Creek Range.

Structure

The project area lies within the Prospect Ridge block and the major faults of the project area, as identified by previous field work and drill data, include the Jackson, Holly, Bowman-150, and Austin Canyon faults **(Figure 3.2-1)**. Fault traces are not well exposed in the area. These faults appear to include both Basin and Range and older (Cretaceous) offsets. Most are believed to be high-angle normal faults. The Jackson, Bowman-150, and Holly faults probably represent the most offset; the latter two would be prominent in the pit. The Bashful Molly and Austin Canyon faults may include some strike-slip component.

Most of the suspected major faults strike north-northwest or north-northeast and represent several hundred or more feet of offset; most appear to dip steeply to the east. Much of this offset is believed to have occurred prior to mineralization and may be related to thrust faulting that preceded Basin and Range faulting, which has obscured the earlier deformation. Best examples of Basin and Range offset are the Spring Valley and Xenophon/Graveyard faults, but some suspected faults north of the pit with northwest and northeast orientations appear to record Basin and Range adjustments.

Mineralization and Pit Geology

The Archimedes deposit is a disseminated gold deposit hosted by Ordovician-age carbonate rocks. Primary hosts include the upper portion of the Goodwin Limestone and the lower Ninemile Formation. Beds in the project area mostly strike northwest and dip gently northeast. Economic gold concentrations appear to correlate with minor faults lying between the Holly and Jackson faults, on the west and east sides of the deposit, respectively (WMC 2004). These less-obvious faults, including sets with northeast and west-northwest orientations represent modest offsets. Ore zones are confined mostly to tabular, elongate jasperoid bodies and lenses of stained, decalcified limestone. Gold is present as finely disseminated particles and originally was deposited with various sulfide species from hydrothermal solutions that circulated through permeable horizons and along fault zones. Oxidation of mineralized bodies extends more than 700 feet in the project area, and virtually all ore in the proposed pit expansion area is oxidized. **Figure 3.2-2** shows a generalized cross-section through the pit.

Other metals besides gold are present in the area but not in identified economic concentrations. Small bodies of lead, silver, and gold ore were extracted from the Holly and Bullwhacker mines southwest of the existing pit, and some pyrite-bearing lead, zinc, gold, and silver-rich zones have been identified beneath the eastern portion of the Archimedes deposit. The oxidized Archimedes ores contain anomalous amounts of arsenic, mercury, and antimony, and arsenic sulfide minerals have been identified in drill core and cuttings from deeper in the system.

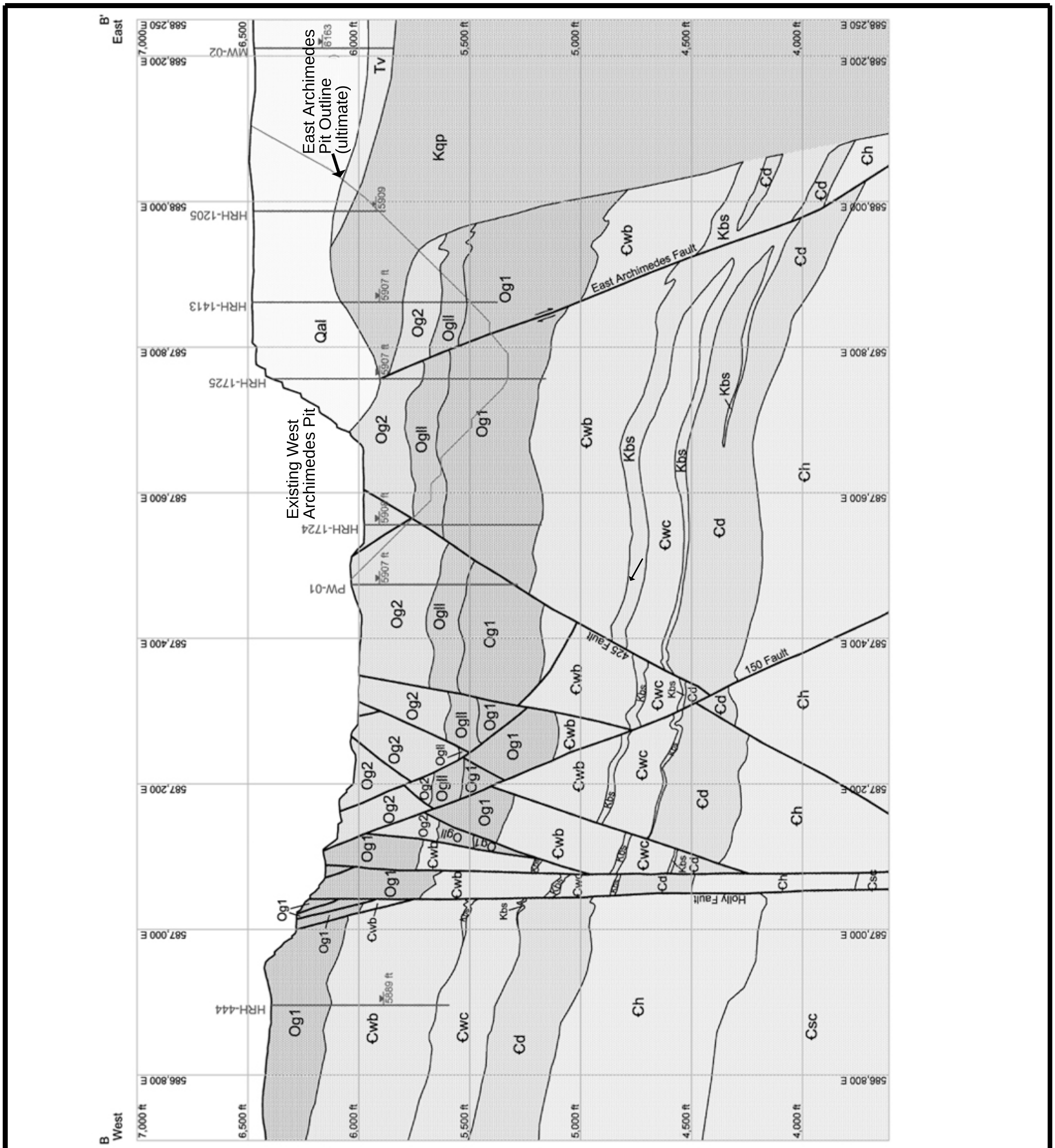
Mineral Resources

Other than the ore identified for mining, no other mineral resources have been identified in the area of the Proposed Action. The following summarizes mineral resources in the general vicinity of the project.

Metallic and Non-metallic Minerals. Metallic mineral resources typically are associated with the region. The Eureka mining district is famous for silver and lead. There are some minor occurrences of copper and other base metals (Nolan 1962). Industrial rock and mineral operations in the area include gypsum and barite mines far to the north and possible sand and gravel operations in the local area. Only minor amounts of silver have been detected in the proposed project area.

Oil and Gas. Oil production has been established in Pine Valley in the northeastern corner of Eureka County. The Blackburn Field, discovered in 1982, was the first commercial oil field in Nevada to be established outside of Railroad Valley (Garside et al. 1988). As of the end of 2003, the Blackburn Field has produced over 5 million barrels of oil (Nevada Division of Minerals 2004b). Oil and gas exploration has been conducted in the northern end of Diamond Valley without commercial success. In 1954, Diamond Valley Corporation drilled an exploratory well in Section 15, T26N, R54E to a depth of 1,072 feet, and in 1956, Shell Oil Company drilled an exploratory well to a depth of 8,042 feet in Section 30, T23N, R54E in Diamond Valley (Harrill and Lamke 1968). An oil and gas test recently was drilled by Noble Energy in Section 22, T24N, R54W. The well was plugged and abandoned in January 2004. The wells did not recover commercially producible oil or gas. There is no known oil or gas potential in the project area.

Geothermal Energy. In the northern part of Diamond Valley, springs are warm and considered to be fault-controlled, deep-circulating groundwater (Harrill and Lamke 1968). The Shipley Hot Spring is located on the east side of the Sulphur Spring Range in the northwest part of Diamond Valley. The spring is reported to be greater than 37 degrees centigrade (Shevenell et al. 2000). No other geothermal sources are indicated in Diamond Valley. The nearest geothermal energy project is the Beowawe Plant approximately 100 miles northwest of the site. There is no geothermal activity associated with the proposed project site.



Legend

Qal - Quaternary alluvium
Tv - Tertiary volcanic tuff
Kqp - Tertiary quartz porphyry
Kbs - Bullwhacker Sill
Op - Pogonip Group
Oav - Antelope Valley Formation
On - Ninemile Formation
Og_u - Goodwin Formation
Og2 - Middle unit
OgII - Lower laminated unit
Og1 - Basal unit

Cw - Windfall Formation
Cwb - Bullwhacker Member
Cwc - Catlin Member
Cd - Dunderberg Shale
Ch - Hamburg Dolomite
Csc - Secret Canyon Formation
Cg - Geddes LImestone
Pre-pumping water elevation

Source: WMC 2004.

Note: See Figure 3.2-1 for location of B-B'.

Ruby Hill Mine Expansion

Figure 3.2-2

Geologic Cross-section East to West

05/06/05

3.2.1.4 Faulting and Seismicity

Faulting

No active faults have been reported in the project area. An active fault has been defined as a fault for which movement has occurred within the last 10,000 to 11,000 years before present (Hart and Bryant 1997). A potentially active fault is a fault that has had surface movement within the last 1.6 million years (Quaternary time). In the project area, movement on the Western Diamond Mountains Fault Zone most likely would generate ground motion in the area. The Western Diamond Mountains Fault Zone is located north to south along the western edge of the Diamond Mountains and is distinguished by linear scarps along the base of the mountains (U.S. Geological Survey [USGS] 2004a). The Western Diamond Mountains Fault Zone is a Quaternary-age fault and therefore is capable of potential activity; however, it is not classified as an active fault. At the south end of the mountain range, the fault zone splays into two branches. One branch turns to the southwest and ends approximately 4.5 miles northwest of Eureka, Nevada. The other branch runs due south along the edge of the mountains through Eureka, Nevada. The USGS did not identify Quaternary faults along the western side of Diamond Valley along the Sulphur Spring Range front (USGS 2004b).

Seismicity

The proposed project site is located in an area of less seismic risk than other parts of Nevada. Seismic activity in the area is common, but the recorded events in the region are not generally of strong magnitude. According to the Nevada Seismological Library earthquake database at the University of Nevada Reno, there have been 110 events greater than 3.0 Richter magnitude within an approximate 60-mile radius of the site from 1852 to July 2004 (Nevada Seismological Library 2004). The strongest event was an estimated 5.0 magnitude earthquake approximately 10 miles east of the site on April 2, 1875.

USGS seismic hazard data and mapping indicate that ground motion in the project area from a maximum credible event would be approximately 10.3 percent of the acceleration of gravity, with a 10 percent probability of exceedance in 50 years. The estimate of ground motion from a strong earthquake in the area indicates that ground motion is not likely to constitute a hazard in the project area.

3.2.2 Environmental Consequences

Impact issues related to geology and minerals include: 1) the extraction and disposition of large amounts of earth materials resulting in permanent changes to topography and geologic materials, 2) creation or exacerbation of geologic hazards from project development, and 3) impacts to potential future resource availability.

3.2.2.1 Proposed Action

Direct impacts of the Proposed Action on geologic and mineral resources would include the generation and permanent disposal of approximately 60 million tons of rock overburden, 130 million tons of alluvial overburden, and 18 million tons of ore. In addition, approximately 744 acres of alluvial fan deposits would be disturbed. Mined ore permanently would be removed from existing reserves.

The Western Diamond Mountains Fault is the nearest known fault to the project area that could cause ground motion in the event of an earthquake generated from the fault. USGS ground motion hazard maps indicate that there is a low probability that ground motion presents a hazard at the site. There are no identified geologic conditions that would be exacerbated by project activities that would result in geologic hazards. The slopes of the expanded pit, waste rock disposal, and heap leach facilities would be constructed to conform to regulatory standards to minimize instability. As discussed in Section 2.3.14, Applicant-committed Environmental Protection Measures, the designs for the waste rock disposal and heap leach facilities would be based on the stability modeling results that were used for the existing facilities, and geotechnical investigations of the pit would continue to assist in optimizing final pit design. In addition, these facilities would be visually monitored to identify any potential stability problems.

Existing geologic information and condemnation drilling results indicate the proposed project would not preclude access to other mineral resources (metallic and non-metallic minerals, oil and gas, and geothermal energy) since there is a low probability of those resources to exist below the footprint of the project.

3.2.2.2 No Action Alternative

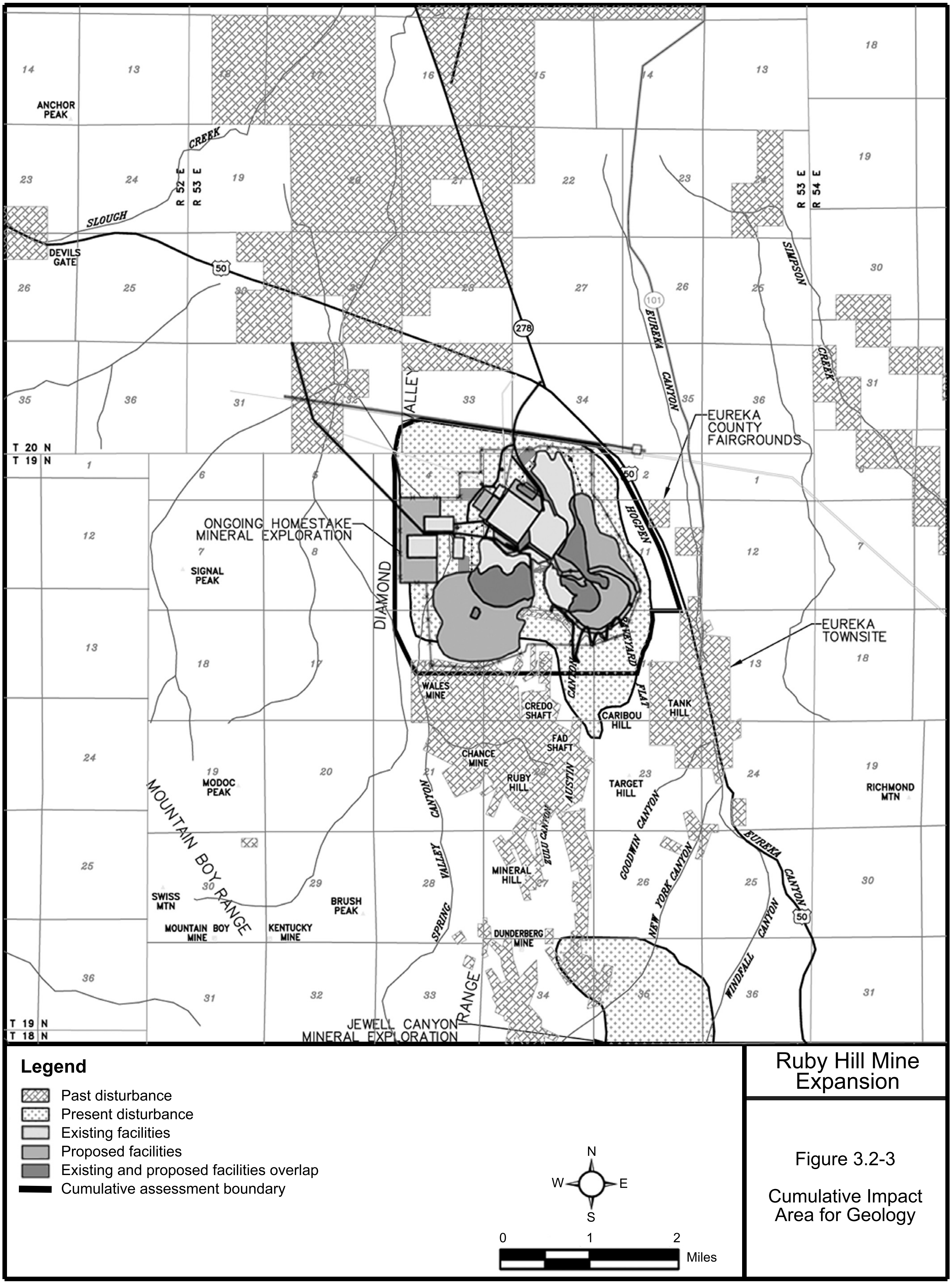
Under the No Action Alternative, the proposed mine expansion would not be developed, and associated impacts to geology and minerals would not occur. As active mining has been completed at the existing Ruby Hill Mine, there would be no additional removal of ore or overburden from the pit or further alteration of the original topography in the mine area.

3.2.3 Cumulative Impacts

Surface mining activity affects geology and mineral resources by excavating, modifying, or covering natural topographic and geomorphic features and by removing mineral deposits. Historically, this area has been mined for many commodities. The cumulative impact area for geology and mineral resources is shown in **Figure 3.2-3**. Interrelated projects are identified in **Table 2-9**.

Disturbances from mining have included open pit and underground mines, waste rock and tailing disposal areas, heap leach ore milling and processing, and exploration (road construction and drilling pads). Production in this district has included gold, silver, and other metals. The estimated cumulative area of disturbance by past mining activities is shown in **Table 2-9**. The Proposed Action incrementally would add to the alteration of topography and permanent removal of ore resources in the cumulative impact area.

Based on the identified occurrence of additional gold mineralization at depth beneath the existing pit and proposed pit expansion areas at the Ruby Hill Mine, and pending the outcome of additional exploration drilling and feasibility studies, underground mining may occur at the mine site in the reasonably foreseeable future. If developed, no additional alteration of existing topography would be anticipated, based on the use of underground mining methods (including concurrent backfill) and the use of existing processing facilities. As the extent of the potential economically recoverable mineralization has yet to be determined, the cumulative interaction with the Proposed Action relative to the removal of ore resources cannot be quantified at this time.



Ruby Hill Mine Expansion

Figure 3.2-3

Cumulative Impact Area for Geology

02/02/05

3.2.4 Mitigation and Monitoring

No monitoring or mitigation measures are recommended for geology and minerals.

3.2.5 Residual Adverse Impacts

Residual adverse impacts associated with the Proposed Action would include the generation and permanent disposal of approximately 190 million tons of waste rock and alluvial overburden, the permanent removal of approximately 18 million tons of ore, and the disturbance of approximately 744 acres of alluvial fan deposits.

3.3 Paleontology

The paleontological resources study area for direct and indirect impacts is the original Ruby Hill Mine study area, which includes the proposed mine expansion area. The cumulative impact area generally ranges from U.S. Highway 50 on the north and east to Hoosac Mountain on the south and the Mountain Boy Range on the west.

3.3.1 Affected Environment

In the larger cumulative impact area, the Pogonip limestones located near Prospect Peak and Hoosac Mountain (approximately 5 miles to the south of the existing Ruby Hill Mine) contain abundant invertebrate fossils of Early and Middle Ordovician age (Nolan 1962). Cambrian to Cretaceous-age sedimentary rocks that include primarily sandstone, quartzite, shale, or conglomerate with some interbedded limestone or dolomite are located near the Locan Shaft. Early Cambrian-age invertebrate fossils have been found in both the shales and limestones of this formation (Nolan 1962).

South of Prospect Peak and along the Prospect Ridge, the Secret Canyon Shale contains fossils of Middle Cambrian age. The late Ordovician-age Hanson Creek Dolomite found at Roberts Creek Mountain and at Wood Cone, southwest of Eureka, is fossiliferous. The Devils Gate Limestone, found on the west side of Spring Valley, west of the Prospect Mountain tunnel, and at the head of Mountain Valley, on the south flank of Prospect Peak, contains abundant Devonian-age fauna including brachiopods, gastropods, and stromatoporoids. The Diamond Peak Formation, which outcrops in the lower Windfall Canyon area and on the lower eastern slopes of Hoosac Mountain, is abundantly fossiliferous and contains invertebrate fossils of Late Mississippian age. The Permian-age Carbon Ridge Formation, located along the eastern border of the Eureka mining district, consists mostly of limestones and has an abundant fossil assemblage, characterized especially by fusulinids. The Early Cretaceous-age Newark Canyon Formation, which generally lies just south of Eureka to the southern border of the Eureka Mining District and from the western slopes of McCoy Ridge to the summit of Hoosac Mountain, commonly contains gastropods and clams. Plant fragments, including silicified wood, have been found in the formation and fish remains and bone also have been identified. Cambrian-age limestone beds with the Hamburg Dolomite locally are fossiliferous and have yielded varied assemblages. Hamburg Dolomite crops out on Adams Hill, north of Ruby Hill (Nolan 1962).

In the study area, exposed geologic formations located within the proposed expansion area consist largely of Pleistocene-age alluvium, Upper Cretaceous-age quartz porphyry, and Cambrian- to Ordovician-age sedimentary rocks, primarily composed of limestone and dolomite with some interbedded sandstone and shale (Nolan 1962). Of these formations, the Ordovician-age Pogonip Group and the Cambrian-age Dunderberg Shale have been identified as containing paleontological resources.

Pogonip Group limestone underlies the proposed heap leach pad expansion and pit expansion areas. Exposures of Dunderberg Shale are located immediately adjacent to the proposed heap leach pad expansion and pit expansion areas. As discussed above, Pogonip limestones located near Prospect Peak and Hoosac Mountain are known to contain abundant invertebrate fossils of Early and Middle Ordovician-age (Nolan 1962). Limestone beds in the Dunderberg Shale are highly fossiliferous and have yielded large and varied invertebrate fauna of Late Cambrian age. Similar fossils have been recorded from many other localities in eastern Nevada (Nolan 1962).

No paleontological resources of critical scientific or educational value are known to occur within the study or cumulative impact areas. The nearest important fossil locality in the vicinity of the proposed mine expansion is near Conical Hill, approximately 8 miles east/northeast of the mine. No vertebrate fossil localities are known to occur within the existing Ruby Hill Mine area (Henry 1996).

3.3.2 Environmental Consequences

3.3.2.1 Proposed Action

Invertebrate and paleobotanical fossils occur in rocks of the Pogonip Group and Dunderberg Shale. Both of these geologic units are found underlying or in the vicinity of the proposed heap leach pad expansion and pit expansion areas and potentially portions of the East and West waste rock expansion areas. However, none of these fossils appear to be unique or site-specific to the project area, and no project-related impacts to scientifically significant or critical fossil resources requiring protection are anticipated. None of the paleontological resources identified in the area of the Proposed Action appear to have critical scientific or educational value (Henry 1996).

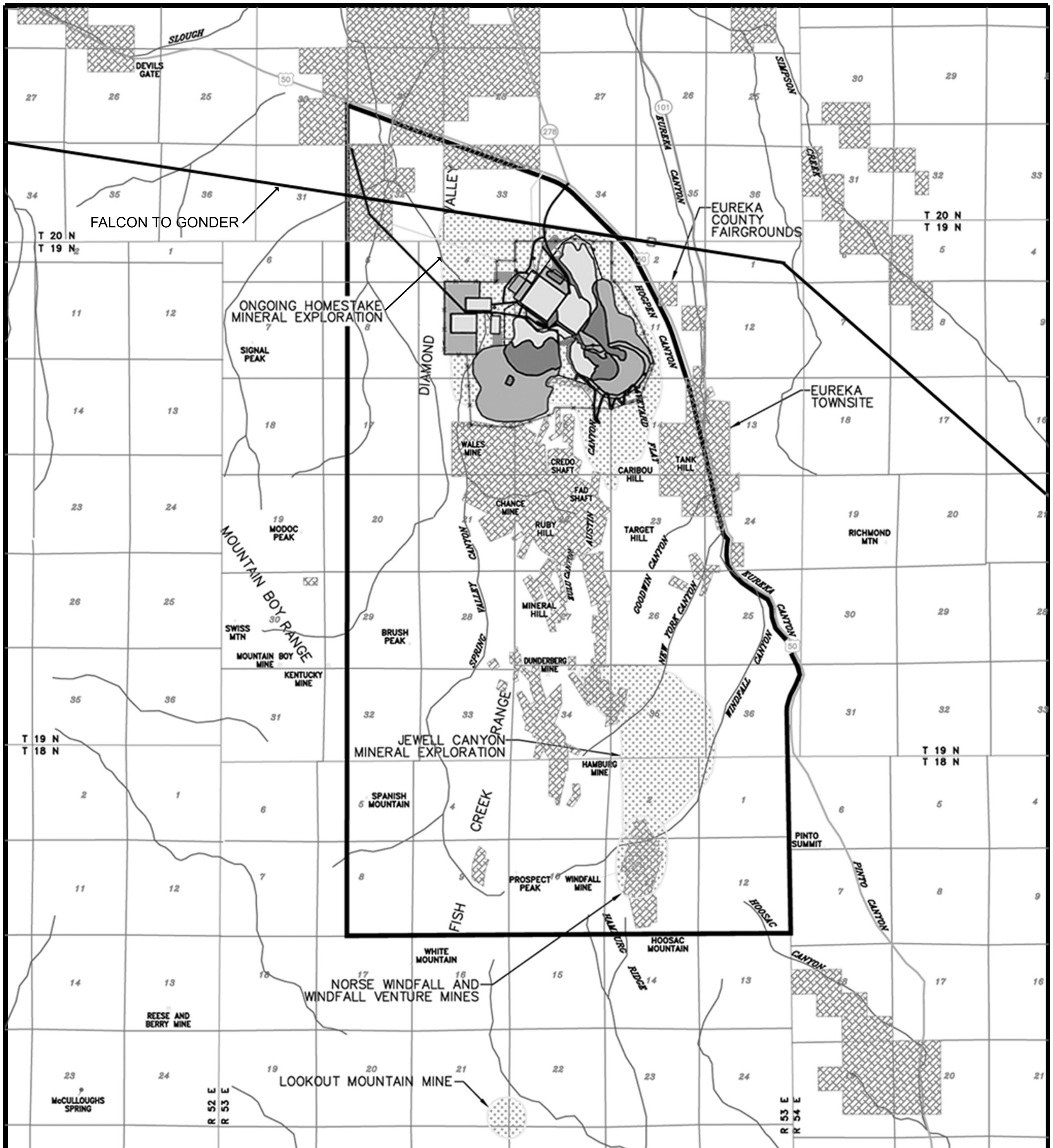
Because fossils usually are buried, their locations cannot be confirmed until excavation occurs. If paleontologically significant fossiliferous deposits, particularly vertebrate fossils, are located during construction, operation, or reclamation, measures would need to be taken to identify and preserve the fossils. Potential direct impacts to paleontological resources from the proposed mine expansion would be limited to areas of disturbance.

3.3.2.2 No Action Alternative

Under the No Action Alternative, the proposed mine expansion would not occur. Ongoing mineral processing at the existing Ruby Hill Mine would continue; however, no new ground-disturbing activities would occur. As a result, there would be no direct impacts to paleontological resources beyond those that may have occurred during previous construction and mining activities. Indirect impacts (e.g., erosional effects and potential collecting) would continue to occur at a rate similar to what is currently occurring in the area. Data that would have been obtained from mitigation of deposits that may have been impacted under the Proposed Action would not be collected.

3.3.3 Cumulative Impacts

The cumulative impact area for paleontological resources is shown in **Figure 3.3-1**. Interrelated projects are identified in **Table 2-9**. Portions of the cumulative impact area lie on known fossiliferous geologic deposits. However, none of the fossils in formations exposed within the cumulative impact area have been identified as scientifically critical, significant, or unique; all are relatively common throughout Nevada (Nolan 1962). Therefore, no cumulative impacts to scientifically significant or critical fossils are anticipated.



Legend

- Past disturbance
- Present disturbance
- Existing facilities
- Proposed facilities
- Existing and proposed facilities overlap
- Cumulative assessment boundary
- Falcon to Gonder (past disturbance)

Ruby Hill Mine Expansion

Figure 3.3-1

Cumulative Impact Area for Paleontological and Cultural Resources

01/28/05

3.3.4 Mitigation and Monitoring

Issue: Disturbance of scientifically significant fossils.

Mitigation Measure P1: If scientifically significant fossils, such as vertebrate fossils, are discovered during mine expansion activities, operation, or reclamation, steps would be taken to identify and preserve them. Homestake would contact the BLM paleontologist in the Battle Mountain Field Office to determine the steps necessary for dealing with the fossils.

Effectiveness: This measure would allow for the evaluation of the importance of any vertebrate fossils that may be discovered and provide adequate time for their preservation or data recovery.

3.3.5 Residual Adverse Impacts

Since no known scientifically significant paleontological resources have been identified in the mine expansion area, no adverse impacts to the resource are anticipated, and no residual adverse effects are expected to occur.

3.4 Water Quality and Quantity

3.4.1 Affected Environment

The water quality and quantity study area for direct and indirect impacts is southern Diamond Valley. The cumulative impact area encompasses the projected area of groundwater drawdown and mounding associated with the Proposed Action.

3.4.1.1 Surface Water

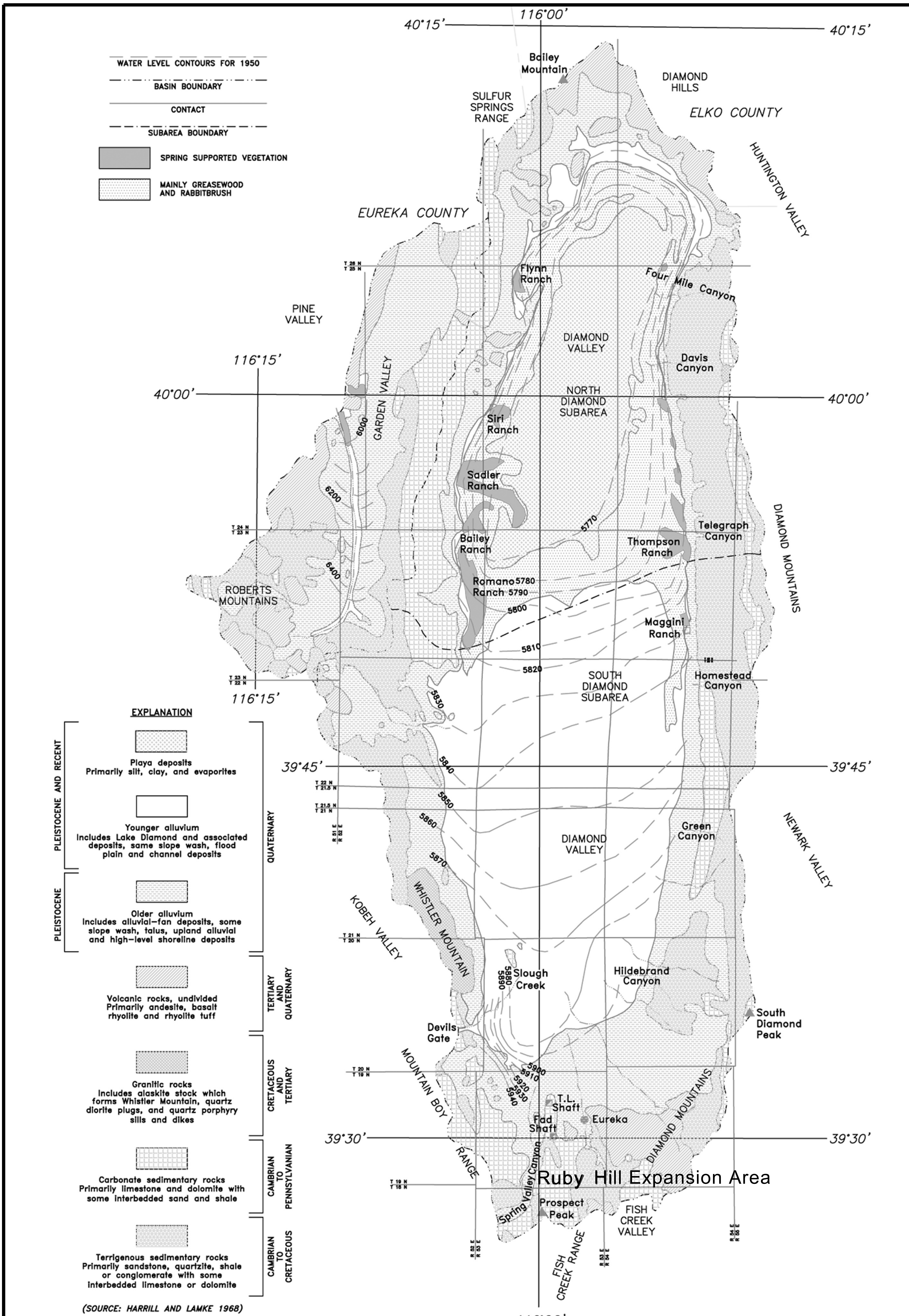
Hydrologic Setting

The proposed Ruby Hill Mine Expansion – East Archimedes Project is located in the southern end of Diamond Valley approximately 0.7 mile northwest of Eureka, Nevada. Diamond Valley is an intermountain valley, with an area of approximately 735 square miles, and is bounded on the east by the Diamond Mountains and on the west by the Sulphur Spring Range, Whistler Mountain, and the Mountain Boy Range. The southern boundary is formed by the Fish Creek Range and the northern boundary by the Diamond Hills (Harrill and Lamke 1968). Due to these surface boundaries, Diamond Valley is a closed hydrographic basin except for inflow through Devils Gate. Devils Gate is a topographic low point between Whistler Mountain and the Mountain Boy Range and permits surface and subsurface inflow from Antelope, Kobeh, and Monitor valleys (Harrill and Lamke 1968). Garden Valley also contributes subsurface flow to the Diamond Valley basin (WESTEC 1996a). For the purposes of this SEIS, the Diamond Valley Hydrographic Basin has been subdivided into two hydrographic subareas: the North Diamond Subarea and the South Diamond Subarea. The Diamond Valley Hydrographic Basin and the North and South Subareas are shown in **Figure 3.4-1.** The proposed project area is located within the southern portion of the South Diamond Subarea.

Surface Water Inventory

A few perennial streams occur in Diamond Valley and are located on the western slopes of the Diamond Mountains (Harrill and Lamke 1968). During very wet years, the channel at Devils Gate and the ditch in Eureka may carry minor amounts of water throughout the year. The only ephemeral streams carrying a substantial snowmelt volume also are located in the Diamond Mountains. Most of the ephemeral and perennial streams flow radially inward from the mountains toward the playa in the north-central part of Diamond Valley and have maximum flow near the base of the mountains. Stream flow diminishes downslope on the alluvial apron because of increased infiltration and evapotranspiration (Harrill and Lamke 1968). No perennial streams are found in the southern region of Diamond Valley. Sixteen intermittent drainages, trending south to north, were identified within the project area by WESTEC (1996a). These drainages were dry at the time of identification and probably carry flow only during precipitation events or seasonal snowmelt.

A waters of the U.S. (WUS) survey previously was conducted within the project area (WESTEC 1995a). Seven of the 16 intermittent drainages located within the existing Ruby Hill Mine area initially were identified as potential WUS. These drainages support only upland vegetation. Following a field review of these drainages, the U.S. Army Corps of Engineers (USACE) determined that these drainages were not



3.4-2

Figure 3.4-1
Water Level Contours
Diamond Valley

Ruby Hill Mine
Expansion

Source: Harrill and Lamke 1968.

01/05/05

jurisdictional WUS (USACE 1996). The intermittent drainages in the mine area are shown in **Figure 3.4-2**; wetlands are not present within the project area.

Several springs are found in the northern and northwestern portions of the North Diamond Subarea. In the South Diamond Subarea, a few small springs occur along the east side of the valley. Most of the springs in Diamond Valley occur near the bases of alluvial fans (Harrill and Lamke 1968). No springs were identified inside the original Ruby Hill Project area during previous surveys (WESTEC 1996a). A regional survey in June 1995 located seven springs and one seep between 2.5 and 3.5 miles away from the existing West Archimedes Pit. All of the springs and the seep were found to the south and southeast of the project area, which is hydraulically upgradient from the Ruby Hill Project. ***Eureka County (2005) provided a list of selected springs of interest to the County; these springs are listed in Table 3.4a and are shown in Figures 3.4-5 and 3.4-6 of the Final SEIS.***

Table 3.4a
Selected Spring Locations

Map Location	***Name***	***Water Right Holder of Record***
A	***House Spring***	***Leonard Fiorenzi***
B	***Corral Spring***	***Leonard Fiorenzi***
C	***Landslide Spring***	***Leonard Fiorenzi***
D	***Fipps Spring***	***William Fipps***

Source: Eureka County 2005.

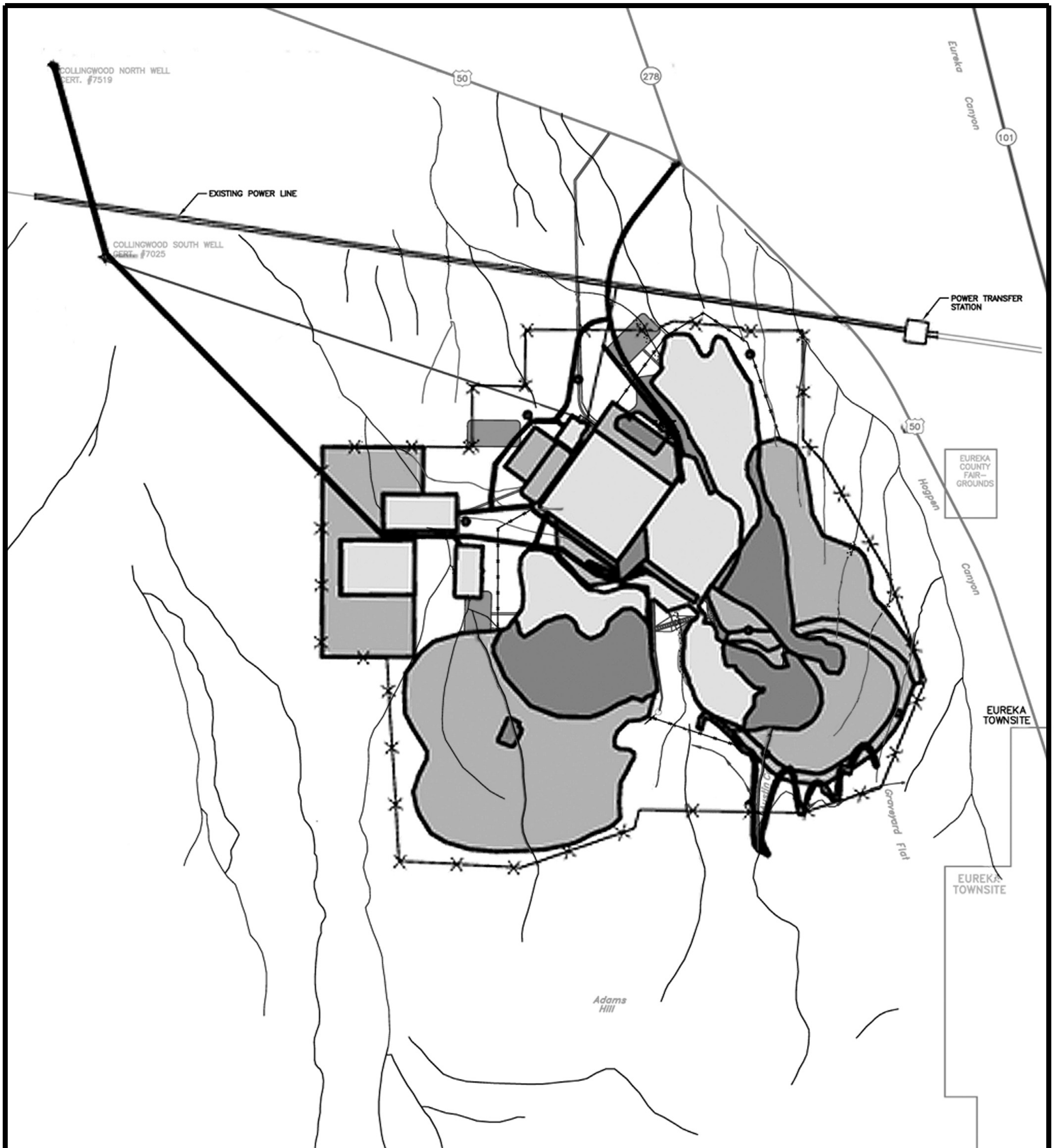
Flood Hydrology

Surface water at the Ruby Hill Mine generally flows from south to north across the site. Most of this surface flow is from storm runoff. No perennial streams exist at the site. The average annual precipitation for the Ruby Hill Mine, for the period from 1952 to 1992, was 12.64 inches; average annual snowfall was 66.5 inches (WESTEC 1996c). Total precipitation for the 10-, 25-, and 100-year, 24-hour storm events is 2.1, 2.6, and 3.2 inches, respectively (WESTEC 1996c).

Surface Water Quality

Waters of the State of Nevada as defined in the Nevada Revised Statutes, Chapter 445, Section 445.191, Waters of the State Defined, include but are not limited to the following: 1) all streams, lakes, ponds, impounding reservoirs, marshes, water courses, waterways, wells, springs, irrigation systems, and drainage systems; and 2) all bodies or accumulations of water, surface or underground, natural or artificial. Water quality standards for state waters have been established by the State of Nevada and are described in the NAC, Chapter 445, Sections 445A.***118*** through 445A.225. Water quality criteria and standards are presented in **Table 3.4-1**.

The chemistry of the ephemeral streams in the project area is not known; even during sampling in 1995, a fairly wet year, all drainages were dry.



Legend

- Intermittent drainages
- Existing facilities
- Proposed facilities
- Existing and proposed facilities overlap

N
W E
S

0 .5 1 Miles

Ruby Hill Mine Expansion

Figure 3.4-2

Intermittent Drainages in the Project Area

01/31/05

Table 3.4-1
Water Quality Criteria and Standards for Nevada

Parameter[2]	Drinking Water Standards[1]			Nevada Agriculture Standards		*Aquatic Life Criteria*[3]	
	USEPA Primary	USEPA Secondary	Nevada	Irrigation	Stock Water	*USEPA CCC*[4] *(chronic criterion)*	*Nevada 96-hour (chronic standard)*
Arsenic ***(As III)***	0.05	--	0.05	0.10	0.20	***0.15***	***0.18***
Aluminum	--	0.05 to 0.20	--	--	--	***0.087***[5]	***--***
Barium	2.0	2.0	2.0	--	--	***--***	***--***
Beryllium	0.004	--	0	0.100	--	***--***	***--***
Cadmium	0.005	--	0.005	0.01	0.05	***0.00025***	***0.001***
Chloride	--	250	250 (400)[6]	--	1,500	***--***	***--***
Chromium ***(Cr III)***	0.10	---	0.10	0.10	1.0	***0.074***	***0.100***
Chromium (Cr VI)	***--***	***--***	***--***	***--***	***--***	***0.011***	***0.010***
Copper	--[7]	1.0	--	0.20	0.50	***0.009***	***0.010***
Cyanide	0.20	--	0.20	--	--	***0.0052***	***0.0052***
Fluoride	4.0	2.0	--	1.0	2.0	***--***	***--***
Iron	--	0.30	--	5.0	--	***1.0***	***1.0***
Lead	--[7]	--	0.05	--	--	***0.0025***	***0.001***
Magnesium	--	150	--	--	--	***--***	***--***
Manganese	--	0.05	--	0.20	--	***--***	***--***
Mercury	0.002	--	0.002	--	0.01	***0.00077***	***0.00012***
Nickel	0.10	--	0.0134	0.20	--	***0.052***	***0.134***
Nitrate (as N)	10	---	10	--	100	***--***	***--***
pH (standard units)	--	6.5 - 8.5	6.5 - 8.5	4.5 - 9.0	5.0 - 9.0	***--***	***--***
Selenium	0.05	--	0.05	0.02	0.05	***0.005***	***0.005***
Sulfate	--	250	250 (500)[6]	--	--	***--***	***--***
TDS	--	500	500 (1,000)[6]	--	3,000	***--***	***--***
Thallium	0.002	--	0.013	--	--	***--***	***--***
Zinc	--	5.0	--	2.0	25	***0.120***	***0.090***

[1]The more stringent of USEPA and Nevada drinking water standards for each parameter is applicable in Nevada.
[2]Units are in milligrams per liter (mg/L) unless noted.
[3]Criteria and standards for hardness-dependent metals calculated based on a hardness of 100 mg/L (as calcium carbonate).
[4]CCC = criterion continuous concentration.
[5]Value is based on total recoverable metal; all others are based on dissolved concentrations.
[6]Mandatory secondary standards for public water systems.
[7]Action level for copper is 1.3 mg/L; action level for lead is 0.015 mg/L.

Sources: Nevada (1995) LCB File No. R128-95, amendment to NAC 445A.232; USEPA Drinking Water Regulations and Health Advisories, February 1996.

Springs within 3 miles of the existing pit were summarized by WESTEC (1996a,c). The results of these analyses are shown in **Table 3.4-2.** Of the constituents measured, all background concentrations were below drinking water standards, except for the selenium concentration in Spring #3 and the iron concentration in Spring #8.

3.4.1.2 Groundwater

Several hydrogeological investigations have been conducted within the Diamond Valley Hydrographic Basin. These studies include an investigation of surface and groundwater quantity and quality, both regionally and within the project area, and modeling of the effects of groundwater withdrawal on water levels in the Ruby Hill Project area (WESTEC 1996a,b,c); investigation of the hydrogeology of Diamond Valley

Table 3.4-2
Surface Water Chemistry in Diamond Valley

Sample Location	Location	Date	pH	TDS	Silicon Dioxide	Iron	Calcium	Magne-sium	Sodium	Potas-sium	Car-bonate	Bicar-bonate	Sulfate	Chloride	Nitrate	Fluoride
			(standard units)							(mg/L)						
Water Quality Standard			<6.5, >8.5 [1]	500[2]-1000[3]	--	0.3[1]	--	150[1]	--	--	--	--	250[2]-	250[2]-400[3]	10[2]	2.0[1]-4.0[4]
Springs (d)	T19N, R53E, S25	5/7/58	7.6	303	39	0	69	10	15	1.2	0	242	41	6.7	1.5	0.4
Slough Creek	T20N, R52E, S26	4/10/54	8.3	3440	21	0.06	41	94	1020	98	35	834	918	800	0.08	1.0
Spring (db)	T23N, R54E, S3	5/17/66	7.8	358	19	0.01	73	22	23	5.1	0	318	51	6.5	1.1	0.4
Spring (ca)	T24N, R52E, S23	4/16/63	7.6	330	30	0	55	21	30	6	0	288	33	17	0.6	0.5
Spring #1	T19N, R53E, S13	12/5/84	n/a	n/a	36	0.10	41.0	13.0	15	4.0	n/a	n/a	n/a	n/a	n/a	n/a
Spring #2	T19N, R53E, S23	12/5/84	n/a	n/a	13	0.00	79	13	10	1	n/a	n/a	n/a	n/a	n/a	n/a
Spring #3	T19N, R53E, S25	12/5/84	n/a	n/a	13	0.00	114	23	15	2	n/a	n/a	n/a	n/a	n/a	n/a
Spring #3	T19N, R53E, S25	7/29/89	7.48	412	16	0.00	103	23	10	2	n/a	452	59	8	2.1	0.19
Spring #4	T20N, R53E, S25	12/5/84	n/a	n/a	11	0.00	113	28	8	1	n/a	n/a	n/a	n/a	n/a	n/a
Spring #5	T19N, R53E, S24	12/5/84	n/a	n/a	36	0.00	32	14	13	3	n/a	n/a	n/a	n/a	n/a	n/a
Spring #6	T19N, R54E, S19	12/5/84	n/a	n/a	54	0.00	20	8	16	4	n/a	n/a	n/a	n/a	n/a	n/a
Spring #7	T19N, R53E, S13	12/5/84	n/a	n/a	43	0.19	16	6	9	4	n/a	n/a	n/a	n/a	n/a	n/a
Spring #8	T19N, R53E, S13	12/5/84	n/a	n/a	15	0.47	71	13	13	3	n/a	n/a	n/a	n/a	n/a	n/a
Spring #9	T19N, R53E, S13	12/5/84	n/a	n/a	32	0.00	67	25	26	6	n/a	n/a	n/a	n/a	n/a	n/a
SPLE #8	T19N, R53E	1/13/72	8.29	286	n/a	0.01	63	16	n/a	n/a	n/a	285	n/a	9	3.4	0.12
Sheriff's office spring		10/18/84	n/a	n/a	30	0.01	60	26	17	4	n/a	n/a	n/a	n/a	n/a	n/a
Sheriff's office spring		10/24/84	n/a	n/a	30	0.00	78	20	17	4	n/a	n/a	n/a	n/a	n/a	n/a
Eureka Co. Mtn. spring		1/10/95	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	0.132

Sample Location	Location	Date	Boron	Arsenic	Barium	Cadmium	Chromium	Copper	Lead	Manganese	Mercury	Selenium	Silver	Zinc	Conductivity
								(mg/L)							(umhos/cm)
Water Quality Standard			--	0.05 [2]	2 [2]	0.005 [2]	0.1 [2]	1.0 [3]	0.05 [2]	0.05[3]	0.002 [2]	0.05 [2]	0.1 [3]	5.0 [1]	--
Springs (d)	T19N, R53E, S25	5/7/58	0.10	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	476
Slough Creek	T20N, R52E, S26	4/10/54	1.8	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	5370
Spring (db)	T23N, R54E, S3	5/17/66	0	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	583
Spring (ca)	T24N, R52E, S23	4/16/63	0.1	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	529
Spring #1	T19N, R53E, S13	12/5/84	0.0	n/a	0.09	n/a	n/a	0.00	n/a	0.00	n/a	0.006	n/a	0.00	n/a
Spring #2	T19N, R53E, S23	12/5/84	0.0	n/a	0.15	n/a	n/a	0.00	n/a	0.00	n/a	0.003	n/a	0.00	n/a
Spring #3	T19N, R53E, S25	12/5/84	0.0	n/a	0.06	n/a	n/a	0.00	n/a	0.00	n/a	0.053	n/a	0.01	n/a
Spring #3	T19N, R53E, S25	7/29/89	0.0	<0.003	0.08	<0.001	<0.005	0.00	<0.005	0.00	<0.0005	0.021	<0.005	0.00	680
Spring #4	T20N, R53E, S25	12/5/84	0.0	n/a	0.06	n/a	n/a	0.00	n/a	0.00	n/a	0.014	n/a	0.01	n/a
Spring #5	T19N, R53E, S24	12/5/84	0.0	n/a	0.10	n/a	n/a	0.00	n/a	0.00	n/a	0.004	n/a	0.00	n/a
Spring #6	T19N, R54E, S19	12/5/84	0.0	n/a	0.09	n/a	n/a	0.00	n/a	0.00	n/a	<0.0025	n/a	0.00	n/a
Spring #7	T19N, R53E, S13	12/5/84	0.0	n/a	0.06	n/a	n/a	0.00	n/a	0.02	n/a	<0.0025	n/a	0.01	n/a
Spring #8	T19N, R53E, S13	12/5/84	0.0	n/a	0.07	n/a	n/a	0.00	n/a	0.00	n/a	<0.0025	n/a	0.01	n/a
Spring #9	T19N, R53E, S13	12/5/84	0.0	n/a	0.16	n/a	n/a	0.00	n/a	0.00	n/a	0.004	n/a	0.01	n/a
SPLE #8	T19N, R53E	1/13/72	n/a	*n/a*	n/a	n/a	n/a	0.05	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Sheriff's office spring		10/18/84	0.0	n/a	0.11	n/a	n/a	0.02	n/a	0.00	n/a	0.021	n/a	0.10	n/a
Sheriff's office spring		10/24/84	0.0	n/a	0.10	n/a	n/a	0.00	n/a	0.00	n/a	0.023	n/a	0.06	n/a
Eureka Co. Mtn. spring		1/10/95	n/a	n/a	0.12	<0.005	0.01	n/a	n/a	n/a	<0.0002	0.009	n/a	n/a	n/a

n/a = not available
[1]Federal secondary water quality standard.
[2]Nevada primary water quality standard.
[3]Nevada secondary enforceable water quality standard.
[4]Federal primary water quality standard.

Note: Zero values indicate values below the analytical detection limit.

(Harrill and Lamke 1968) and the Ruby Hill Project area (Canonie Environmental 1994); investigation of the chemistry of the proposed pit waste rock (Scanlan Engineering 1994; WESTEC 1996d); investigation of the hydrogeology at the proposed mine water supply wells (Scanlan Engineering 1994); and an investigation of water-level changes in Diamond Valley (Arteaga et al. 1995). Recent studies include a hydrogeological investigation by WMC (2004) and groundwater modeling for dewatering of the proposed East Archimedes Pit (Jones 2004). These investigations have defined the hydrogeologic and geochemical conditions within the Diamond Valley Hydrographic Basin and beneath the Ruby Hill Project area. **Table 3.4-3** presents a summary of the transmissivities and hydraulic conductivities of the units present within the Ruby Hill Project area.

Table 3.4-3
Hydrogeological Data in the Project Area

Test Holes[1]	Associated Geologic Unit	Type of Test	Transmissivity (gpd/ft)[2]	Hydraulic Conductivity (feet/second)	Source
Fad Shaft	Eldorado Dolomite	Pumping	24,000	--	Nolan 1962
HRH-444 (P)	Bullwhacker	Slug	NA	3.4×10^{-8}	WESTEC 1996a
WB-01 (U)	Bullwhacker Member[3]	Constant Head	NA	1.3×10^{-6}	WESTEC 1996c
WB-03 (U)	Bullwhacker Member[3]	Constant Head	NA	9.8×10^{-5}	WESTEC 1996c
WB-06 (P)	Bullwhacker Member[3]	Falling Head	NA	9.8×10^{-6}	WESTEC 1996c
WB-07 (P)	Bullwhacker Member[3]	Falling Head	NA	6.6×10^{-6}	WESTEC 1996c
HRH-286 (P)	Goodwin Formation	Slug	NA	1.3×10^{-5}	WESTEC 1996a
HRH-1141 (P)	Goodwin Formation	Slug	NA	2.2×10^{-6}	WESTEC 1996a
HRH-1142 (P)	Goodwin Formation	Slug	NA	6.6×10^{-6}	WESTEC 1996a
HRH-1144 (P)	Goodwin Formation	Slug	NA	2.4×10^{-6}	WESTEC 1996a
North Collingwood Well (W)	Alluvium	Pumping	90,000	NA	Scanlan 1994
Old South Collingwood Well (W)	Alluvium	Pumping	470,000	NA	Scanlan 1994
HRH-1724(U)	Carbonate Rock	Injection/recovery	NA	$3.28E^{-06}$	WMC 2004
HRH-1727(U)	Carbonate Rock	Injection/recovery	NA	$1.97E^{-05}$	WMC 2004
BRH-01(U)	Carbonate Rock	Injection/recovery	NA	$5.90E^{-06}$	WMC 2004
HRH-1734(P)	Alluvium	Injection/recovery	NA	$1.64E^{-06}$	WMC 2004
HRH-1735(P)	Alluvium	Injection/recovery	NA	$8.20E^{-08}$	WMC 2004

[1]P = Piezometer, U = Uncased Corehole, W = Well
[2]gpd/ft = gallons per day per foot
[3]Unsaturated

Groundwater recharge, storage, and flow depend on geological conditions. Within the project area and Diamond Valley, groundwater occurs in both alluvium and bedrock aquifers. In the alluvium, groundwater recharge, flow, storage, and discharge are controlled by the permeability of the unconsolidated sediments. In the bedrock, porosity, permeability, and structure (i.e., faults and fractures) control the recharge, flow, storage, and discharge of groundwater.

Groundwater within the basin generally flows toward a valley-fill reservoir located in the North Diamond Subarea. Regional groundwater level contours from 1950, before extensive aquifer pumping for agriculture began, are shown in **Figure 3.4-1**. This reservoir is approximately 45 miles long, 6 to 12 miles wide, and consists of alluvial and playa deposits (Harrill and Lamke 1968). Groundwater within the basin flows both in the alluvium and in the bedrock. In the northern part of Diamond Valley, springs are warm and groundwater is considered to be deep-circulating and fault controlled (Harrill and Lamke 1968). Artesian conditions were encountered by Harrill and Lamke (1968) in most of the irrigation wells in the North Diamond Subarea, and springs and flowing wells are common along the west side of the North Diamond Subarea. In the South Diamond Subarea, artesian conditions occur where silt and clay form overlying confining lenses. These lenses are most common along the eastern side of the valley, but also are present in other areas (Harrill and Lamke 1968).

The groundwater system in the project area is part of the regional Diamond Valley Hydrographic Basin. Groundwater in the project area generally flows toward the center of Diamond Valley. Within the eastern portion of the project area, groundwater flows to the northwest; in the western portion, it flows to the northeast; and in the center, it flows to the north. Groundwater occurs in alluvium at the northwestern portion of the project area and within bedrock beneath the existing West Archimedes Pit, proposed mine expansion area, and mine facilities (WESTEC 1996a).

Hydrogeology of the Project Area

Paleozoic sedimentary rocks and Mesozoic granitic rocks form the basement assemblages throughout the region. These rocks are exposed on Prospect Ridge and underlie the volcanic and alluvial deposits in Diamond Valley. A detailed stratigraphic column is presented in **Table 3.2-1**. Paleozoic rocks consist of highly folded thrust sheets composed of multiple formations. The granitic rocks include a quartz diorite plug and a quartz porphyry in the form of sills and dikes. The Paleozoic rocks have been intruded by a series of granitic plutons.

Groundwater within the basement rocks generally is stored and transmitted through a system of interconnected fractures or fracture networks and may be stored and transmitted through solution caverns and channels. Due to the broad variation of rock types and the complex pattern of fracturing, the hydraulic properties of the bedrock units are highly variable.

The hydrogeology of the Paleozoic rock units is only partially understood. The Prospect Mountain Quartzite has been found to have a low primary permeability (Nolan 1962), but it may have secondary permeability from extensive fracturing. The Pioche Shale is commonly folded, faulted, and sheared and is relatively impermeable (Canonie Environmental 1994). Studies of the Fad Shaft, located south of the project site, found an extensive aquifer in the Eldorado Dolomite. These studies determined that the Eldorado Dolomite has a transmissivity of 24,000 gpd/ft and a storage coefficient of 0.00067 at the Fad Shaft (Nolan 1962) (**Table 3.4-3**).

Past mining operations have shown that the Geddes Limestone can yield large quantities of water (Canonie Environmental 1994). The Secret Canyon Shale is often folded, faulted, and sheared and is relatively impermeable. During the sinking of the Fad Shaft, the Secret Canyon Shale did not produce much water (Canonie Environmental 1994). The Hamburg Dolomite is extensively fractured and may be permeable if solution caverns or channels are present.

In the project area, the following Paleozoic basement units are present: the Eldorado Dolomite, Geddes Limestone, Secret Canyon Shale, Hamburg Dolomite, Dunderburg Shale, Windfall Formation, and Pogonip Group. The Pogonip Group consists of the Goodwin, Ninemile, and Antelope Valley formations. The Graveyard Flat intrusive cuts the Paleozoic carbonate rocks. Younger units in the project area include Tertiary rhyolite dikes, Tertiary and Quaternary volcanic tuffs, and Quaternary alluvium (WMC 2004).

The Eldorado Dolomite is a fractured carbonate unit composed of a massive, thickly-bedded gray dolomite with limestone beds near the base of the formation. The unit has an estimated thickness of 2,000 feet (WMC 2004). This formation has been host to much of the mineralization in the district and has been one of the most important units economically in the district. The flooding of the Fad Shaft during historic mining of lead, zinc, and silver in the district occurred when fractures in the Eldorado Dolomite were penetrated (WMC 2004), suggesting that this unit carries considerable groundwater in its network of fractures. This unit has a transmissivity of approximately 24,000 gpd/ft (**Table 3.4-3**).

The Geddes Limestone is a dark blue to black carbonaceous, fine-grained limestone that is approximately 350 feet thick. The unit is highly folded and faulted, but apparently is relatively impermeable and not a substantial water-bearing unit in the district (WMC 2004).

The Secret Canyon Shale has two members: a lower shale member, and an upper member consisting of limestone bands separated by argillaceous partings (WMC 2004). The total thickness of the unit is approximately 400 to 650 feet, and the unit is relatively impermeable.

The Hamburg Dolomite is a strongly fractured dolomite that historically hosted a number of mining operations. Except for some limestone beds at its base, the unit is a massive dolomite that has been hydrothermally altered and silicified. The unit is approximately 1,000 feet thick and carries considerable groundwater in its fracture network (WMC 2004).

The Dunderburg Shale is a thick, brown, fissile shale that is interbedded with thin beds of nodular gray limestone. The unit is approximately 250 feet thick (Nolan 1962). The formation is highly deformed, folded, and faulted, and its thickness can vary considerably. The Dunderburg Shale is probably an aquiclude; however, depending on the degree of fracturing and folding, the shale may allow storage and transmission of water.

The Windfall Formation is subdivided into the Catlin and Bullwhacker members. The Catlin Member is composed of interbedded massive limestones with some cherty zones and platy, sandy limestones, and is approximately 250 feet thick (Nolan 1962). The Bullwhacker Member conformably overlies the Catlin Member and is a sandy limestone that is approximately 400 feet thick, thinly bedded, and platy. One aquifer test (i.e., slug) by WESTEC (1996a) of piezometer HRH-444 completed in the Bullwhacker Member indicates that the formation has a hydraulic conductivity of 3.4×10^{-8} feet per second near the north end of the West Archimedes Pit. Two constant and two falling head tests of unsaturated Bullwhacker Limestone indicate an average hydraulic conductivity of 2.9×10^{-5} ft/sec (**Table 3.4-3**). Both of these members are composed mainly of limestone and thus may contain solution caverns or channels. This unit is present beneath the Archimedes deposit and is a substantial water-bearing unit (WMC 2004).

The Pogonip Group is made up of three formations: the Goodwin, Ninemile, and Antelope Valley formations. The Goodwin Formation is the oldest of the formations and is the main ore-producing layer for the Archimedes deposit at the Ruby Hill Mine. The Goodwin Limestone is a massively bedded, fine to medium grained limestone containing grey and white chert, and is approximately 1,000 feet thick (WESTEC 1996d). Four aquifer tests by WESTEC (1996a) of piezometers (HRH-286, -1141, -1142, -1144) completed in the Goodwin Formation indicate that the formation has an average hydraulic conductivity of 6.1×10^{-6} feet per second below the West Archimedes Pit (**Table 3.4-3).** The Goodwin Formation is the most important water-bearing unit in the Ruby Hill Mine area (WMC 2004). The Ninemile Formation is the middle member of the Pogonip Group and is composed of a fine to very fine-grained limestone, with thin shaly beds in the middle of the formation. It is approximately 250 to 400 feet thick, and has some local mineralization (WESTEC 1996d). Exploration drilling in the area of the proposed pit expansion indicated that little of the Ninemile Formation is present above the Goodwin Formation. Lost drilling fluid circulation during exploration within the Ninemile Formation is thought to be the result of caverns, solution channels, or fractures (Canonie Environmental 1994). If these lost circulation zones are interconnected by fractures or solution channels, transmissivities would be expected to be high. The shaly nature of the middle part of the Ninemile Formation could act as an aquitard, depending on fracturing and dissolution, either confining or perching water. The Antelope Valley Formation is the upper member of the Pogonip Group, but it is not found in the pit area. The Antelope Valley Formation is similar to the Goodwin Limestone in that it is a massive bedded limestone; however, it has a substantially lower chert component. Low water production during previous mineral exploration below the water table indicates that this formation probably has a low permeability in the area of the pit (Canonie Environmental 1994), including the proposed pit expansion area.

The Graveyard Flat Intrusive is a quartz feldspar porphyry that is present south of the proposed pit. Intrusive igneous rocks have little primary permeability but may have secondary fracture permeability.

Tertiary rhyolite dikes are found exposed in the district approximately 1 mile to the southeast of the Archimedes deposit at Target Hill. These dikes are impermeable.

Tertiary volcanic tuffs consist of air-fall tuffs that have been observed overlying the Graveyard Flat intrusive. These tuffs thicken toward the east. Tertiary volcanic tuffs in Diamond Valley consist of a layer of rhyolite that is approximately 100 feet thick. The rhyolite flows and dikes appear to be Oligocene to Miocene in age (Nolan 1962) and have virtually no primary porosity, but may transmit minor quantities of water through faults, fractures, and weathering (Harrill and Lamke 1968). Piezometer HRH-1205, completed in the volcanics near the south end of the West Archimedes Pit, took more than 36 hours to recharge any water (WESTEC 1996a), indicating that the transmissivity is low. In the late Tertiary to Quaternary periods, a series of silicic pyroclastic rocks, predominantly rhyolite tuff, and a series of andesitic and basaltic flows were deposited. These tuffs usually have little interstitial porosity (Harrill and Lamke 1968). A layer of welded tuff has been described in the sequence and would be denser than the rest of the layer (Nolan 1962). The entire tuff sequence has a measured thickness of up to 400 feet. The andesitic and basaltic lavas overlying the rhyolite tuff are up to 700-feet-thick. These flows are similar hydrogeologically to the rhyolite tuffs but chemically are very different due to the higher amounts of iron and magnesium.

Quaternary alluvium is found throughout Diamond Valley and along the mountain slopes that border the valley. Diamond Valley is a fault-bounded basin with mountain ranges on either side. The basin is filled with detritus derived from the ranges. These unconsolidated sediments consist of silt, sand, gravel, cobbles, and boulders deposited as alluvial fans, intermittent streams, and occasionally as lakes. They increase in thickness from the mountain fronts to the center of the valley, where they are up to 7,500-feet-thick (Harrill and Lamke 1968). In the area of the proposed expansion, the alluvium is approximately 500 feet thick. The two wells located on the Collingwood Ranch, in the northern part of the project area, were completed in alluvium. Aquifer testing of two of these wells indicates that transmissivities range from 90,000 to 480,000 gpd/ft (Scanlan Engineering 1994). Short-term aquifer testing in other parts of Diamond Valley indicate that transmissivities in the alluvial aquifer ranges from 27,000 to 250,000 gpd/ft (Harrill and

Lamke 1968). Injection tests conducted by WMC (2004) in the alluvium resulted in hydraulic conductivity values ranging from 1.6×10^{-6} to 8.0×10^{-8} ft/sec. Calculations by WESTEC (1996a) indicate that the alluvial aquifer in southern Diamond Valley probably is unconfined. In addition, review of well logs for Sections 28, 29, 30, and 32 of T20N, R53E indicate that no extensive clay layers exist, which could indicate a confined aquifer (WESTEC 1996a). **Figure 3.2-1** presents the general geology in the vicinity of the mine site; **Figures 3.2-2** and **3.4.3** provide east-west and north-south cross-sectional views of the project area geology, respectively.

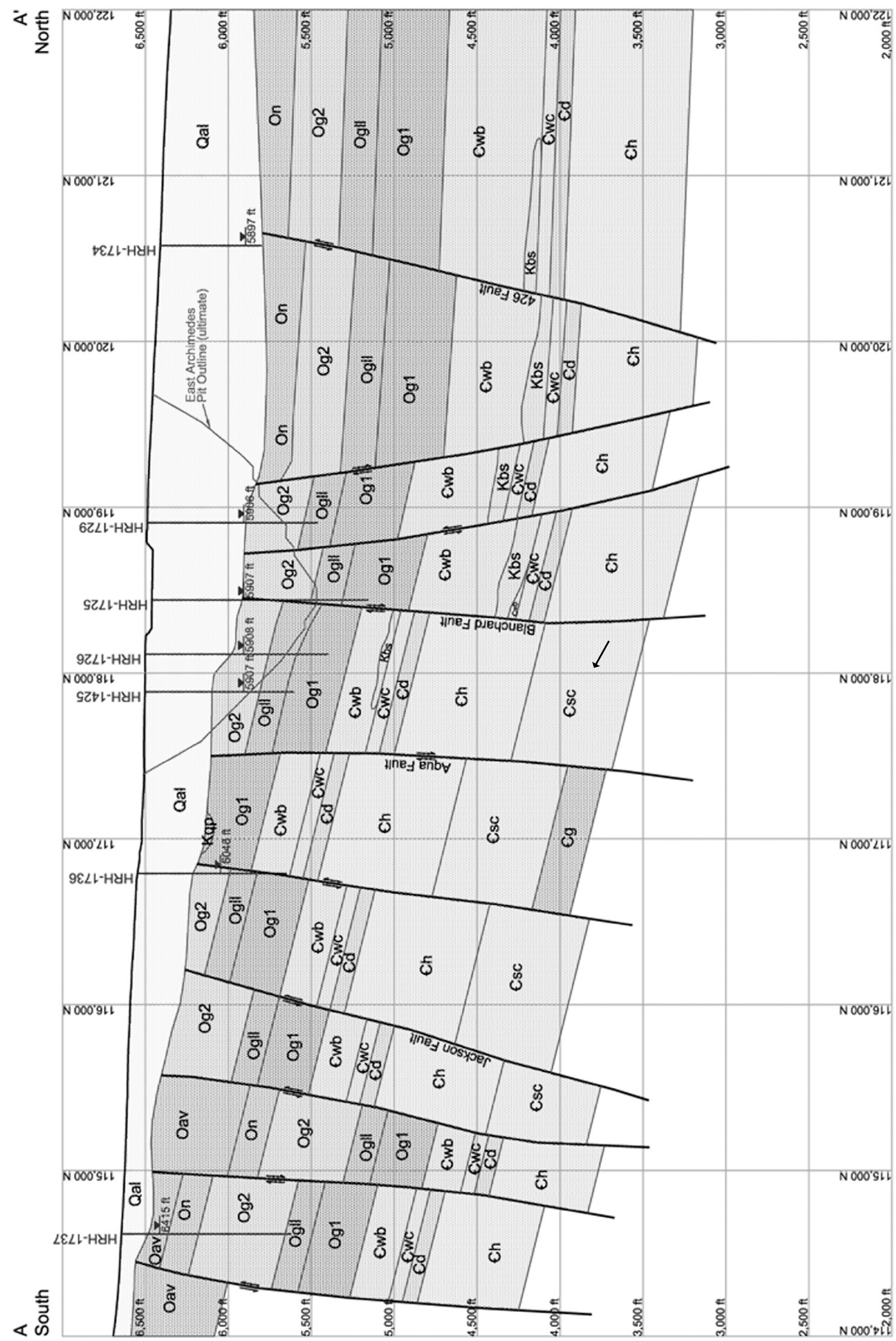
Fault Zones

The Prospect Hill area (**Figure 3.2-1**), which encompasses most of the Eureka Mining District including the Archimedes deposit, is a faulted and folded anticline (WMC 2004). Within the Prospect Hill area are north-trending Basin-and-Range faults, such as the Bowman and the Holly-150 faults. These are high-angle normal faults, with varying displacement, which are post-mineralization and have the eastern side down-faulted relative to the western side of the fault trace. Faults such as the Williamsburg Fault (**Figure 3.2-1**) and many of the northeast-trending faults that connect to the Williamsburg Fault have controlled the emplacement of the mineralization. The maximum displacement along the northeast-trending faults is approximately 500 feet (WMC 2004). Important northeast-trending faults that are related to mineralization in the Archimedes Block include the Aqua (Bullwacker) Fault, the 426 Fault, and the Jackson Fault. An important northwest-trending fault in the Archimedes Block is the Blanchard Fault (**Figure 3.2-1**).

As shown in **Figure 3.2-1,** the intersection of northeast-trending faults and the north-trending Basin-and-Range faults has resulted in the Prospect Hill area being broken into a number of subblocks. These subblocks are important from the standpoint of groundwater flow, structural permeability to groundwater movement in the carbonate bedrock, mineralization, and movement of groundwater during the proposed dewatering of the East Archimedes Pit. The Archimedes Block is the most important block because it hosts most of the disseminated gold mineralization and is the block that will be dewatered during the proposed mining of the East Archimedes deposit. Groundwater movement during dewatering and during post-closure pit refilling with groundwater will be controlled by the faults shown in **Figure 3.2-1.**

Faults can act as either barriers or conduits to groundwater flow. The faulting influence on groundwater flow is dependent on the physical and lithological characteristics of the rock. Faulting of softer, less competent rocks can form crushed and pulverized rock (fault gouge), which would act as a barrier to groundwater flow. Mineralization along faults also can reduce or prevent the transmission of water. Faulting of harder, more competent rock can create conduits that allow higher groundwater flow rates and greater permeability to groundwater flow than surrounding unfaulted rock.

Within the Archimedes deposit, the Holly-150 Fault appears to be a ***restriction*** to the lateral movement of groundwater (WMC 2004). The Blanchard Fault, however, appears to be quite permeable to groundwater flow. The Basin-and-Range faults appear to form ***restrictions*** to groundwater flow, as evidenced by changes in static water levels across the faults (WMC 2004).



Legend

Qal - Quaternary alluvium
Kqp - Tertiary quartz porphyry
Kbs - Bullwhacker Sill
Op - Pogonip Group
  Oav - Antelope Valley Formation
  On - Ninemile Formation
  Og_u - Goodwin Formation
    Og2 - Middle unit
    OgII - Lower laminated unit
    Og1 - Basal unit

Cw - Windfall Formation
  Cwb - Bullwhacker Member
  Cwc - Catlin Member
Cd - Dunderberg Shale
Ch - Hamburg Dolomite
Csc - Secret Canyon Formation
Cg - Geddes LImestone
Pre-pumping water elevation

Note: See Figure 3.2-4 for location of A-A'.

Source: WMC 2004.

Ruby Hill Mine Expansion

Figure 3.4-3

Geologic Cross-section North to South

10/28/04

Structural Blocks in the Project Area

The project site has been subdivided into structural blocks based on geology, water levels, and groundwater quality (WMC 2004). These blocks are expected to behave somewhat independently during pit dewatering and pit refilling. Important blocks near the East Archimedes deposit include the following (**Figure 3.2-1**):

Archimedes Block. This block covers most of the proposed East Archimedes Pit area and is bounded by the Aqua Fault on the south, the Holly-150 Fault on the west, and the Graveyard Flat intrusive on the east. The Porcupine Block bounds the Archimedes Block on the north and is separated from the Archimedes Block by an unnamed fault. The Archimedes Block contains mostly carbonates from the Pogonip Group and the Windfall Formation. The block is hydraulically continuous for over 2,000 feet in depth and has static water levels in monitor wells that range from 5,902 to 5,907 feet amsl. This block is covered by alluvium.

Holly and Jackson Blocks. The Holly and Jackson blocks form a stair-stepped set of blocks to the south of the Archimedes Block. These blocks are covered by alluvium and contain carbonate units of the Windfall and Goodwin formations. Water levels in monitor wells range from 5,992 to 6,435 feet amsl. The Jackson Fault represents a major east-northeast structure that causes water levels to drop over 400 feet across the fault zone. Parallel faults to the Jackson Fault also appear to bound groundwater flow.

Williamsburg Block. This block is a narrow north-south trending block between the Holly Fault on the east and the Williamsburg Fault on the west. The block contains the Catlin Member of the Windfall Formation and the Hamburg Dolomite. The static water level in the block is 5,887 feet amsl.

Bowman Block. This block lies south of the Williamsburg Block and is bounded by the Holly Fault and the Bowman Fault. The Fad Shaft lies within this block and penetrates the Eldorado Dolomite. Pumping records for the Fad Shaft indicate substantial groundwater inflow at an elevation of 4,660 feet amsl where a cross-cut in the shaft crosses the Martin Fault. The static water elevation in the Bowman Block is approximately 5,921 feet amsl.

TL Block. This is a relatively isolated block of carbonate rock bounded on the east by the Williamsburg Fault. The primary rock unit in this block is the Hamburg Dolomite, which is water bearing. The water level in the T.L. shaft is the static water level for this block, which is currently at 5,823 feet amsl. This block may be hydraulically connected to bedrock north of the block boundaries.

Spring Valley Block. This block lies beneath the alluvial sediments in Spring Valley, which is directly west of Mineral Point and the TL Block. The primary groundwater bearing units are the Bullwacker and Catlin members of the Windfall Formation and the Hamburg Dolomite. Groundwater static elevations are approximately 5,889 to 5,892 feet amsl.

Powerline Block. This block lies along the powerline and is immediately north of the Spring Valley Block. The block is narrow, trends northeast, and parallels northeast-trending faults in the area. The primary carbonate units are the Windfall Formation and the Hamburg Dolomite. Static water elevations measured in monitor wells are 5,808 and 5,805 feet amsl. Groundwater in this block may communicate with water in the alluvium of Diamond Valley.

Porcupine Block. This block is situated north of the Archimedes Block. The water-bearing carbonate rock units are the Antelope Valley, Ninemile, and Goodwin formations. The static water elevation is approximately 5,839 feet amsl, which is 35 to 40 feet above groundwater elevations in the valley alluvium to the north.

Graveyard Block. The intrusive and volcanic rocks that lie east of the proposed East Archimedes Pit are part of a large block with overall low permeability. The groundwater elevation in this block is approximately 6,162 feet amsl. This water elevation was recorded from one monitor well (MW-2) screened in volcanic rock and may not represent the entire block.

Alluvium

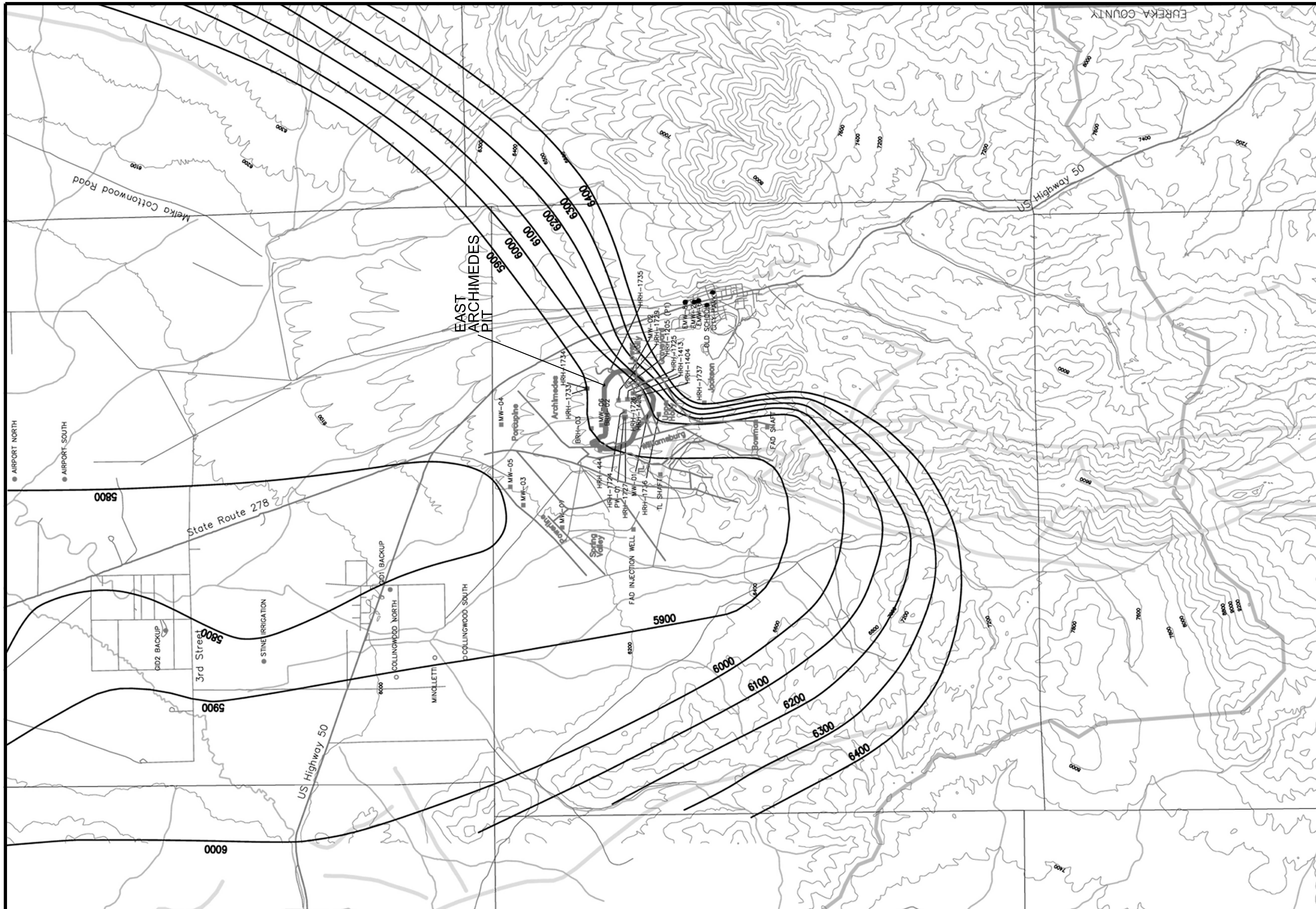
Saturated alluvium occurs northeast of the proposed East Archimedes Pit. This alluvial material thickens to the north and joins the finer-grained, valley-fill alluvial sediments of the South Diamond Subarea. In the area of the proposed East Archimedes Pit, the alluvium contains two paleochannels. The maximum thickness of the alluvium near the proposed East Archimedes Pit is approximately 500 feet. The alluvium is moderately cemented with calcite and has a low permeability (**Table 3.4-3**). The static water level in the alluvium near the proposed pit ranges from 5,893 to 5,913 feet amsl (WMC 2004).

Water Levels

The Diamond Valley groundwater level contours for 1950 are shown in **Figure 3.4-1**. These contours are based on work done by Harrill and Lamke (1968) and represent groundwater conditions before the beginning of extensive irrigation pumping. Development and extensive agricultural pumping from 1950 through 1990 has caused a decline in groundwater levels of approximately 50 feet in the South Diamond Subarea; in 1990, groundwater levels in the developed part of the South Diamond Subarea were declining at a rate of 1.5 to 2.5 feet per year (Arteaga et al. 1995).

The project area groundwater potentiometric (level that water would rise to in a well) surface elevations for 1995 are shown in **Figure 3.4-4.** Below the heap leach facilities, process facilities, West Archimedes Pit, and waste rock dumps, the permanent groundwater table occurs in carbonate bedrock. In the northern and western portions of the project area, the bedrock aquifer begins a transition to the alluvial aquifer found in Diamond Valley. The potentiometric surface of groundwater below the West Archimedes Pit and within the project area was determined by measurement of four monitoring wells, nine piezometers, and two irrigation wells (Jones 2004; WMC 2004). Recent groundwater elevations in the project area obtained by Homestake from monitor wells installed prior to the mining of the West Archimedes Pit, and newer monitor wells installed in the area of the proposed East Archimedes Pit, are shown in **Figure 3.4-4**.

The communication between the bedrock and alluvial aquifers is not well understood. Based on studies in other Nevada basins (i.e., Huntington, Newark, and Long valleys), the hydraulic communication between carbonate bedrock and overlying valley alluvium is expected to be low (Eakin 1960 and 1961). Between 1950 and 1966, groundwater levels south of U.S. Highway 50 declined 0 to 5 feet, and water levels north of U.S. Highway 50 declined 5 to 10 feet (WESTEC 1996a; Harrill and Lamke 1968).



Legend

- Monitoring wells recent alluvium
- Monitoring wells older alluvium
- Monitoring wells volcanic rock
- Monitoring wells carbonate rock
- County wells
- Hydrologic area boundary
- Hydrologic blocks

N S E W

0 2 Miles

Source: Jones 2004.

Ruby Hill Mine Expansion

Figure 3.4-4

Groundwater Elevations in 1995

02/02/05

Groundwater elevations beneath the project area range from approximately 5,900 to 6,200 feet amsl. Groundwater elevations near the West Archimedes Pit to the south and southeast (upgradient) are higher than those below the pit and range from approximately 6,000 to 6,200 feet amsl. Faults bounding the West Archimedes Pit on the south and southeast control groundwater movement and cause a very steep groundwater gradient outside of the pit area. The northwest-trending faults that form the boundaries of the structural blocks found east of the Williamsburg Fault appear to restrict groundwater flow, resulting in differing potentiometric groundwater levels in the Archimedes Block and adjacent structural blocks in the area of the proposed East Archimedes Pit (**Figure 3.2-1**).

Aquifer Recharge and Discharge

Recharge to the regional groundwater basin occurs principally from infiltration of precipitation within the valley and surrounding mountains. Infiltration of surface flow from Devils Gate and subsurface inflow from Devils Gate and Garden Valley also contribute to groundwater in the Diamond Valley Hydrographic Basin. Harrill and Lamke (1968) estimate recharge to Diamond Valley to be approximately 30,000 acre-feet per year from precipitation and interbasin flow.

Recharge to the alluvial aquifer in the northern portion of the project area is principally from precipitation and infiltration of water from ephemeral streams carrying snowmelt. Recharge to the bedrock aquifer below the proposed pit expansion area and associated facilities is derived from infiltration of precipitation and snowmelt into bedrock outcrops and fractures in these outcrops. It is likely that the bedrock aquifer also contributes some recharge to the alluvial aquifer.

Water in the aquifers in the Diamond Valley Hydrographic Basin is discharged by pumping for agricultural and domestic purposes, evaporation, evapotranspiration by vegetation, and spring discharge. The largest discharge is from groundwater pumping for irrigation. Arteaga et al. (1995) estimated that 64,000 acre-feet of groundwater was removed from the South Diamond Subarea for irrigation in 1990.

Well Inventory

Homestake currently owns water rights that allow pumping of 1,110 acre-feet per year (688 gpm) of groundwater (WESTEC 1996a). Homestake purchased the water rights from the Collingwood Ranch, which previously had used the water rights for irrigation.

A review of local well records supplied by the Nevada Division of Water Resources and discussions with Eureka County officials indicate there are five known producing wells located near the town of Eureka (see **Table 3.4-4**). Additionally, there are several shallow monitoring wells in Eureka that are part of an ongoing hydrocarbon monitoring effort. Of the producing wells, two serve as backup water supply for the town of Eureka (Spring Street and Atlas wells), two serve as seasonal irrigation water for city parks/lawns (Elementary School and City Park wells), and one serves as a backup irrigation supply for a small private residence on the northwest edge of Eureka (Melka well). The Elementary School, City Park, and Melko wells see periodic seasonal use as weather conditions warrant. The Spring Street and Atlas backup water supply wells have not been used for over 10 years since the installation of several production wells in Southern Diamond Valley that now supply the town of Eureka. Also, eight known producing wells are located in the general U.S. Highway 50 area northwest of the mine area (see **Table 3.4-4**). ***Eureka County***

(2005) also provided a list of all known wells within Sections 19 through 36 in Township 20 North, Range 53 East; these wells are listed in Table 3.4-4a and are shown in Figures 3.4-5 and 3.4-6.

Table 3.4-4
Wells Within Potential Area of Impact

Wells	Location	Depth (feet below ground surface)	Screened Interval (feet below ground surface)	Water Level (feet below ground surface)
Producing Wells				
Spring Street Well	T19N, R53E, S13, SW¼,	294	214 – 284	Unknown[1]
Atlas Well	T19N, R53E, S14, SE¼	379	290 – 379	Unknown[2]
Elementary School Well	T19N, R53E, S14, SE¼	265	Unknown[3]	33.4
City Park Well	T19N, R53E, S13, SW¼	60	40 – 60	19.3
Melka Well[4]	T19N, R53E, S14, NE¼	130	Unknown	30
Ithurralde Well	T20N, R53E, S30, NW¼	200	Unknown[3]	49
Ithurralde Well	T20N, R53E, S30, NW¼	176	100 – 176	65
Herrera Well	T20N, R53E, S30, SE¼	200	120 – 130/170 – 190	125
R. Collingwood Well	T20N, R53E, S32, NW¼	179	119 – 179	156
Minoletti Well	T20N, R53E, S32, SE¼	218	120 – 200	120
Homestake Well	T20N, R53E, S32, SW¼	260	180 – 260	198.2
Rowley Well	T20N, R53E, S29, SW¼	350	280 – 350	145
Anderson Well	T20N, R53E, S29, SW¼	300	84 – 298	50
Monitoring Wells				
Eureka MW-1	T19N, R53E, S13, SW¼	14	3.5 - 13.5	2.9
Eureka MW-2	T19N, R53E, S13, SW¼	18	7.5 - 17.5	10.7
Eureka MW-3	T19N, R53E, S13, SW¼	16.5	6 - 16	9.3
Eureka MW-4	T19N, R53E, S13, SW¼	18.5	7.5 - 17.5	11.7
Eureka MW-5	T19N, R53E, S13, SW¼	16	5.5 - 15.5	8.8
Eureka MW-6	T19N, R53E, S13, SW¼	19	8.5 - 18.5	9.7
Eureka MW-7	T19N, R53E, S13, SW¼	16	5.5 - 15.5	8.1
Eureka MW-8	T19N, R53E, S13, SW¼	23	11 - 21	13.8

[1]No access available at wellhead to determine current water level.
[2]No access available at wellhead to determine current water level; water level was 160 feet in 1982.
[3]Not indicated on well log files with state.
[4]All information based on recollection of current owner; well log unavailable.

Groundwater Quality

Groundwater quality data for Diamond Valley are summarized in **Table 3.4-5**. Harrill and Lamke (1968) found that the regional groundwater chemistry in Diamond Valley varies as the groundwater migrates from recharge areas in the mountains to discharge areas in the northern part of the valley. In general, calcium, magnesium, and bicarbonate are the major ions near the recharge areas. In discharge areas, sodium, potassium, chloride, and sulfate are dominant, and evapotranspiration causes concentrations of dissolved solids to increase (Harrill and Lamke 1968). The Nevada Bureau of Health Protection Services has adopted the federal primary and secondary standards for groundwater used for human consumption. These levels are listed in **Table 3.4-5**.

More recently, the groundwater near the project area has been studied by Canonie Environmental (1994), WESTEC (1996a), and WMC (2004) (**Tables 3.4-5** and **3.4-6**). These reports include data for domestic

Table 3.4-4a
Wells within Township 20 North, Range 53 East, Sections 19 through 36

Map Location	Section	Location		Current Owner
1	19	SW¼	NW¼	BLM, Battle Mountain
2	20	SW¼	SW¼	Dave Stine Farms
3	20	SW¼	SE¼	Dave Stine Farms
4	20	SE¼	NE¼	Dave Stine Farm
5	21	NE¼	NW¼	JJ and Bobbi Goicoechea
6	21	SE¼	SE¼	Larry and Tricia Etter
7	21	SE¼	NE¼	Don Morrison
8	21	SE¼	SW ¼	VanVliet Brothers
9	21	NW¼	NW ¼	Edwin Bishop
10	21	SE¼	NW¼	Edwin Bishop
11	22	SW¼	NW¼	Elaine B. Johnson
12	23	SW¼	NE¼	BLM, Battle Mountain
13	24	SE¼	SW¼	Chad Bliss
14	24	SW¼	SE¼	Chad Bliss
15	28	NW¼	SW¼	Joe Maslach
16	28	SW¼	SW¼	Devils Gate GID
17	28	SW¼	SW¼	Rick Rodeman
18	28	SW¼	SE¼	Mike and Diana Podborny
19	28	NW¼	SW¼	Curtis P. Hayward
20	28	SW¼	NW¼	Kip & Ann Marie Merritt
21	28	NW¼	SW¼	Dennis Gordon
22	28	NW¼	NW¼	Norbert Walter
23	28	NE¼	SE¼	Wayne Robinson
24	28	SW¼	SE¼	Everet Haney
25	28	SW¼	SE¼	Curtis P. Hayward
26	28	SE¼	NE¼	Ernie Allen
27	28			Diamond Valley Well #2
28	28	NW¼	SE¼	Eureka County
29	28	SE¼	SE¼	Eureka County
30	28			M. VanVliet & Sons
31	28	SE¼	SE¼	County Public Works Director
32	28	SE¼	NE¼	M. VanVliet & Sons
33	28	SE¼	NW¼	Leta Bishop
34	28		NE¼	Leta Bishop
35	29	SW¼	SW¼	Glenn Demplsey
36	29	NW¼	SE¼	David E. Groth
37	29	NE¼	NW¼	Ed and Jerry Anderson
38	29	SE¼	NW¼	Ernie Taylor
39	29	SE¼	SE¼	Earl A Rasmussen
40	29	NW¼	SE¼	Gary Garaventa
41	29	SW¼	SW¼	Russel Rowley
42	29	SW¼	SW¼	Don Hull
43	29	SW¼	SE¼	G.W. Oliver
44	29	SW¼	NW¼	Ed and Jerry Anderson
45	29		SE¼	Ed and Jerry Anderson
46	29		NW¼	Bruce Peters
47	30	NW¼	NE¼	Gary Garaventa
48	30	SE¼	SE¼	RC Herrera
49	30	NW¼	SE¼	James Ithurralde
50	30	NW¼	SE¼	Jim Ithurralde

Table 3.4-4a (Continued)

Map Plot #	Section	Location		Current Owner
51	30	SW¼	SE¼	Jim Ithurralde
52	30	NW¼	NE¼	Gary Garaventa
53	30	SW¼	NE¼	Gary Garaventa
54	32	NW¼	NW¼	Homestake Mining Co
55	32	SW¼	SW¼	Homestake Mining Co
56	32	SE¼	NE¼	County Public Works Director
57	32	NW¼	NW¼	Rex Collingwood
58	32	SE¼	NW¼	Fred Minoletti
59	32	SE¼	NE¼	County Public Works Director
60	32	SE¼	NW¼	Fred Minoletti
61	32	NW¼	NW¼	Rex Collingwood
62	32	SW¼	SW¼	Devere Collingwood (Homestake?)
63	32	NW¼	NW¼	Dee Collingwood (Homestake?)
64	32	SW¼	SW¼	D. Collingwood (Homestake?)
65	34		SE¼	Helds 1/4 Ranch
66	34	SE¼	NW¼	County Public Works Director

Notes:
1. Location is accurate to quarter/quarter section.
2. Not all well owners may be current.

Source: Eureka County 2005.

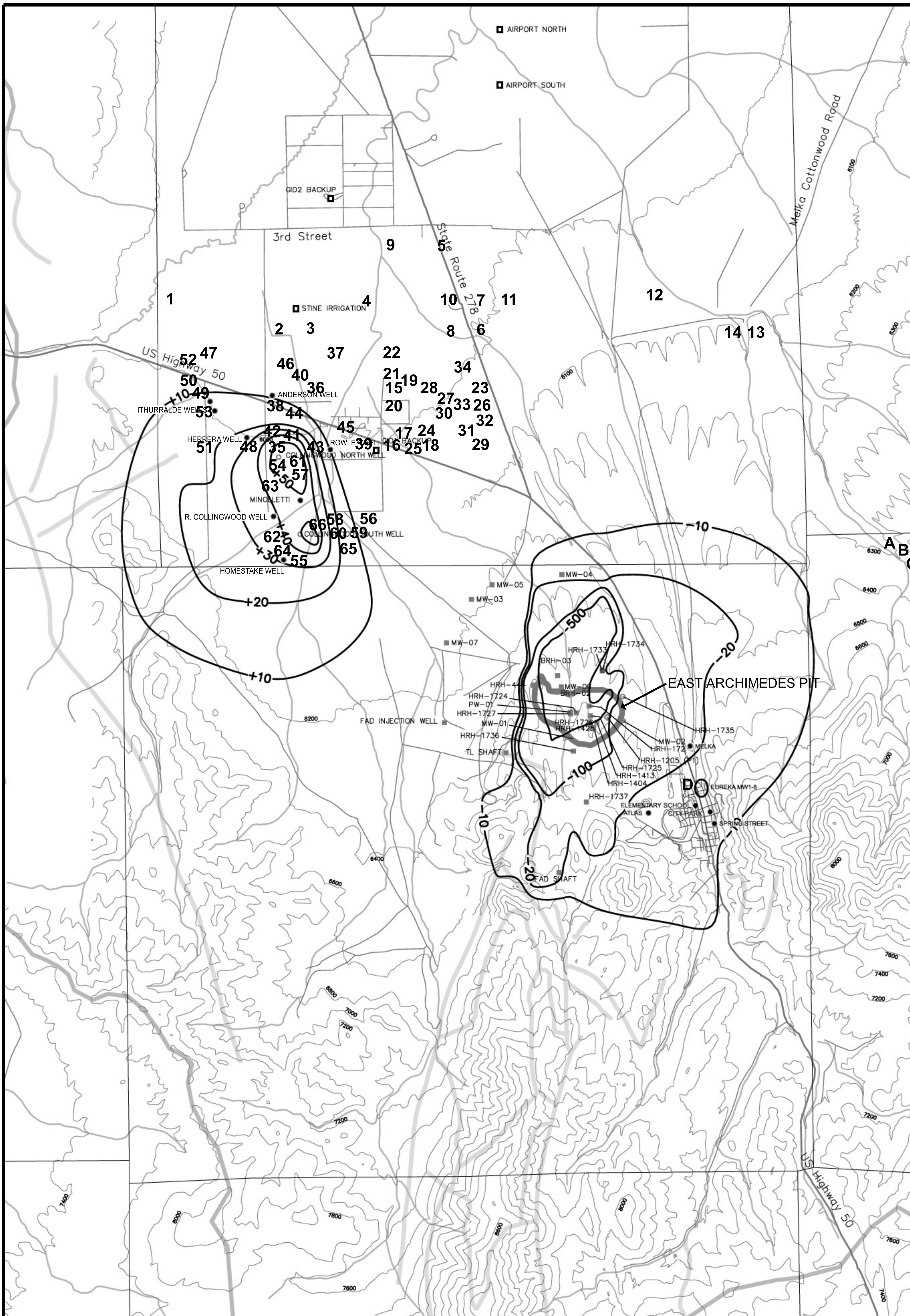


Figure 3.4-5

Injection Scenario
Groundwater Level
Change in Feet
Year 2012

Ruby Hill Mine
Expansion

Legend

- Monitoring wells recent alluvium
- Monitoring wells older alluvium
- Monitoring wells volcanic rock
- Monitoring wells carbonate rock
- Known producing wells
- Hydrologic area boundary

1-66 Wells (Locations are accurate to quarter/quarter section.)

A-D Springs

Note: Eureka MW 1-8 represents a cluster of shallow monitoring wells.

Source: Homestake 2004a; Eureka County 2005.

0 2 Miles

N S E W

06/16/05

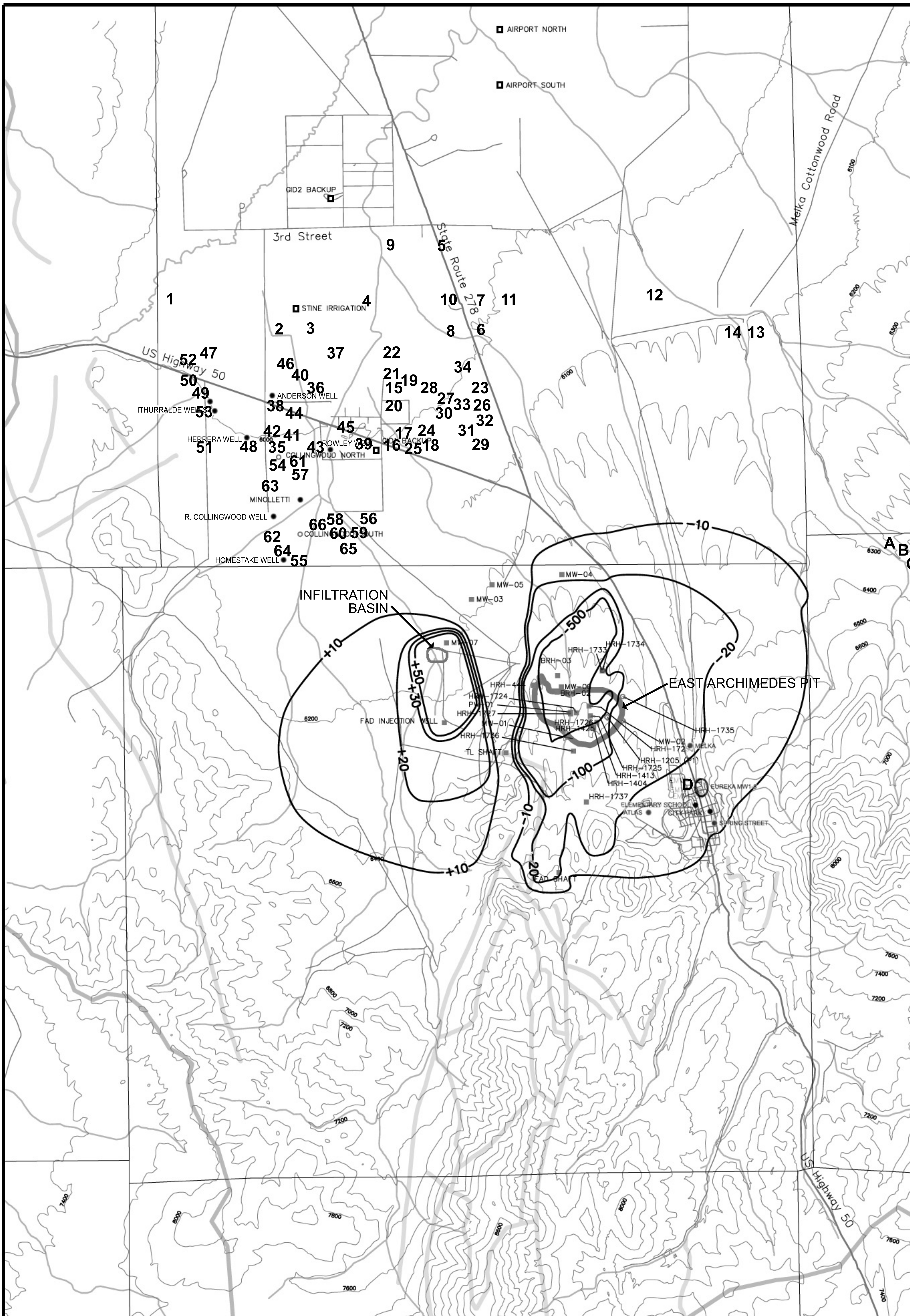


Figure 3.4-6
Infiltration Basin Scenario
Groundwater Level
Change in Feet
Year 2012

Ruby Hill Mine
Expansion

Legend

- Monitoring wells recent alluvium
- Monitoring wells older alluvium
- Monitoring wells volcanic rock
- Monitoring wells carbonate rock
- Known producing wells
- Hydrologic area boundary

1-66 Wells (Locations are accurate to quarter/quarter section.)
A-D Springs

Note: Eureka MW 1-8 represents a cluster of shallow monitoring wells.
Source: Homestake 2004a; Eureka County 2005.

0 2 Miles

06/16/05

Table 3.4-5
Groundwater Chemistry in Diamond Valley

Sample Identification	Location	Date Sampled	Aquifer	pH (standard units)	TDS	Silicon Dioxide	Iron	Calcium	Magne-sium	Sodium	Potas-sium	Car-bonate	Bicar-bonate	Sulfate	Chloride
					(mg/L)										
Water Quality Standard				<6.5, >8.5[1]	500[2]-1000[3]	--	0.3[1]	--	150[1]	--	--	--	--	250[2]-	250[2]-400[3]
Harrill & Lamke 1968															
In project area															
Fad Shaft (bd)[4]	T19N, R53E, S15	1/21/53	bedrock	7.8	267	11	0.02	52	26	8.3	1.4	0	238	38	10
Near project area															
Well (cc)	T20N, R53E, S17	5/5/66	--	7.8	475	28	0.01	72	25	62	8.2	0	398	52	31
Well (ad)	T20N, R53E, S21	5/9/66	--	7.6	302	39	0	51	20	17	5.1	0	220	45	14
Well (ab)	T21N, R53E, S03	7/11/66	--	7.8	500	44	0	63	13	85	8.8	0	302	76	60
Well (cb)	T21N, R53E, S05	5/18/66	--	7.8	478	42	0.01	66	25	60	8.8	0	312	71	50
Well (da)	T21N, R53E, S13	5/17/66	--	7.5	257	28	0	46	16	17	2.2	0	207	39	6.0
Well (cc)	T21N, R53E, S28	5/17/66	--	7.8	444	38	0	74	25	43	6.8	0	368	45	30
Well (da)	T21N, R53E, S33	7/11/66	--	7.8	549	37	0	78	26	73	12	0	406	68	54
Well (ac)	T21N, R53E, S36	5/20/66	--	7.7	242	16	0.01	57	10	13	1.2	0	204	34	8
Far from project area															
Shallow well (aa)	T22N, R53E, S27	5/17/66	--	8.1	854	11	0.18	46	21	224	22	0	354	173	180
Shallow well (cc)	T22N, R53E, S30	5/17/66	--	8.6	371	8.4	0.01	21	17	88	16	8	262	34	48
Well (ab)	T22N, R54E, S34	3/10/54	--	7.4	458	37	0.13	78	36	27	5.5	0	356	77	16
Well (ca)	T23N, R52E, S13	5/5/66	--	8.3	346	26	0.01	41	27	39	8.2	4	264	45	25
Well (dd)	T23N, R53E, S34	5/17/66	--	7.9	718	15	0.02	26	22	216	26	0	374	5	220
Well (ac)	T24N, R53E, S06	5/5/66	--	8.0	276	25	0	51	20	15	3.4	0	255	25	10
WESTEC 1996															
MW-1	T19N, R53E, S15	9/22/95	bedrock	n/a	440	27.3	<0.017	33.3	8.85	150	6.21	109.2	93	67.7	30.2
MW-1	T19N, R53E, S15	10/26/95	bedrock	9.06	320	23.2	<0.017	40.3	13.3	65.0	3.09	40.8	151	31.8	30.2
MW-1	T19N, R53E, S15	1/09/96	bedrock	8.85[5]	277	n/a	<0.024	46.2	15.4	36.2	2.65	--	--	28.0	31.6
MW-2	T19N, R53E, S11	9/21/95	bedrock	7.61	274	73.1	0.145	26.9	11.8	28.6	8.49	0	176	26.2	4.9
MW-2	T19N, R53E, S11	10/25/95	bedrock	7.86[5]	264	73.3	0.049	27.9	12.0	28.0	8.36	0	176	23.2	4.8
MW-2	T19N, R53E, S11	1/08/96	bedrock	7.86	253	n/a	<0.024	28.0	12.0	26.1	8.74	--	--	24.1	5.0
MW-3	T19N, R53E, S03	9/21/95	bedrock	7.76	369	12.7	0.042	35.5	48.2	32.6	3.18	0	324	55.2	6.2
MW-3	T19N, R53E, S03	10/25/95	bedrock	7.78	345	12.6	<0.017	32.9	47.0	31.1	2.25	0	319	52.5	6.1
MW-3 (dup.)	T19N, R53E, S03	10/25/95	bedrock	n/a	344	12.7	<0.017	33.3	47.7	31.6	2.30	0	318	53.0	6.1
MW-3	T19N, R53E, S03	1/08/96	bedrock	7.90[5]	274	n/a	<0.024	32.1	46.6	29.5	2.66	--	--	54.9	6.4
MW-4	T19N, R53E, S03	9/22/95	bedrock	n/a	313	26.1	<0.017	36.2	19.4	48.2	3.01	0	179	49.2	34.3
MW-4	T19N, R53E, S03	10/26/95	bedrock	8.08	306	25.4	<0.017	37.2	20.0	38.9	2.08	0	178	35.5	35.5
MW-4	T19N, R53E, S03	1/09/96	bedrock	7.73[5]	285	n/a	<0.024	37.9	20.0	33.7	3.29	--	--	30.7	37.1
Fad Shaft	T19N, R53E, S22	9/22/95	bedrock	n/a	281	12.8	<0.017	60.2	28.2	10.9	1.13	0	257	49.6	10.8
Fad Shaft	T19N, R53E, S22	10/26/95	bedrock	7.65	308	13.0	<0.017	60.1	28.7	11.5	1.50	0	256	48.7	11.0
Fad Shaft	T19N, R53E, S22	1/18/94	bedrock	7.74	280	n/a	0.19	56	27	8.9	2.4	0	256	46	10
Collingwood North well	T20N, R53E, S32, NW, NW	7/11/94	Quaternary alluvium	7.75	219	n/a	0.03	41	21	7.3	1.4	0	233	17	5
Collingwood Old South well	T20N, R53E, S32, SW, SW	7/20/94	Quaternary alluvium	7.69	246	n/a	0.06	44	23	7.8	1.7	0	213	17	13
Rubio	T20N, R53E, S29	10/7/77	Quaternary	7.68	249	n/a	0.02	39	21	16	2	0	193	17	20
J. Minoletti	T20N, R53E, S32	10/15/88	Quaternary	7.92	573	n/a	0.38	86	43	20	2	0	188	17	n/a
J. Minoletti	T20N, R53E, S32	2/29/88	Quaternary	7.85	400	n/a	0.03	64	33	12	2	0	202	18	27
S. Oliver	T20N, R53E, S29	2/29/88	Quaternary	8.06	205	n/a	0.04	26	12	19	4	0	151	17	10
D. Sharrow	T20N, R53E, S34	2/29/88	Quaternary	7.87	231	n/a	0.02	39	17	12	4	0	198	23	8
L. Melka	T19N, R53E, S14	9/7/86	Quaternary	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	0	n/a	n/a	n/a
B. Melka	T19N, R53E, S14	3/10/87	Quaternary	7.39	896	n/a	0.01	143	48	65	11	0	478	165	75
B. Melka	T19N, R53E, S14	3/30/83	Quaternary	7.54	885	n/a	0.03	140	48	56	11	0	485	160	81

Table 3.4-5 (Continued)

Sample Identification	Location	Date Sampled	Aquifer	pH (standard units)	TDS	Silicon Dioxide	Iron	Calcium	Magne-sium	Sodium	Potas-sium	Car-bonate	Bicar-bonate	Sulfate	Chloride
					(mg/L)										
Water Quality Standard				**<6.5, >8.5[1]**	**500[2]-1000[3]**	--	**0.3[1]**	--	**150[1]**	--	--	--	--	**250[2]-**	**250[2]-400[3]**
Canonie 1994															
HRH-458 @ 985[6]	--	5/28/94	--	7.98	234	n/a	n/a	47	16	11	1.6	n/a	204	33	15
HRH-386 @ 925[6]	--	5/18/94	--	8.03	326	n/a	n/a	54	22	14	1.7	n/a	257	41	13
HRH-251 @ 780-790[6]	--	5/19/94	--	8.27	188	n/a	n/a	38	14	11	2.2	n/a	151	12	22
HRH-512[6]	--	5/11/94	--	8.22	264	n/a	n/a	39	20	15	3.2	n/a	162	21	36
Collingwood North Well	T20N, R53E, S32, NW, NW	7/11/94	Quaternary alluvium	7.75	219	n/a	0.03	41	21	7.3	1.4	n/a	233	17	5
Fad Shaft	T19N, R53E, S22	1/18/94	bedrock	7.74	280	n/a	0.19	56	27	8.9	2.4	n/a	256	46	10
Fad Shaft- 800 tap[4]	T19N, R53E, S22	1/21/53	bedrock	7.80	267	11	0.02	52	n/a	8.3	1.4	n/a	290	38	10
Holly Shaft- W8[4]	T19N, R53E	6/6/49	--	n/a	296.8	6.4	0.12	53.2	19.7	1.5	n/a	n/a	301	21.8	28.4

Table 3.4-5 (Continued)

Sample Identification	Location	Date	Nitrate	Fluoride	Boron	Arsenic	Barium	Cadmium	Chromium	Copper	Lead	Manganese	Mercury	Selenium	Silver	Zinc	Conductivity
			mg/L														(umhos/cm)
Water Quality Standard			10[1]	2.0[2]-4.0[3]	--	0.05[1]	2[1]	0.005[1]	0.1[1]	1.0[2]	0.05[1]	0.05[2]	0.002[1]	0.05[1]	0.1[2]	5.0[4]	--
Harrill & Lamke 1968																	
In project area																	
Fad Shaft (bd)[4]	T19N, R53E, S15	1/21/53	2.6	0	0.06	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	467
Near project area																	
Well (cc)	T20N, R53E, S17	5/5/66	0.5	0.5	0.1	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	760
Well (ad)	T20N, R53E, S21	5/9/66	2.7	0.3	0	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	467
Well (ab)	T21N, R53E, S03	7/11/66	0.8	0.3	0.2	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	788
Well (cb)	T21N, R53E, S05	5/18/66	1.0	0.5	0.1	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	758
Well (da)	T21N, R53E, S13	5/17/66	0.4	0.1	0	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	406
Well (cc)	T21N, R53E, S28	5/17/66	0.2	0.4	0.1	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	709
Well (da)	T21N, R53E, S33	7/11/66	0.6	0.6	0.1	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	878
Well (ac)	T21N, R53E, S36	5/20/66	2.8	0.1	0	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	400
Far from project area																	
Shallow well (aa)	T22N, R53E, S27	5/17/66	1.9	0.7	0.6	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	1430
Shallow well (cc)	T22N, R53E, S30	5/17/66	0.6	0.3	0.3	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	635
Well (ab)	T22N, R54E, S34	3/10/54	5.5	0.6	0.12	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	709
Well (ca)	T23N, R52E, S13	5/5/66	0.6	0.4	0.1	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	560
Well (dd)	T23N, R53E, S34	5/17/66	2.5	0.6	0.5	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	1300
Well (ac)	T24N, R53E, S06	5/5/66	0.5	0.4	0	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	449
WESTEC 1996																	
MW-1	T19N, R53E, S15	9/22/95	1.98	<0.5	0.06	0.77	0.00	<0.002	0.005	<0.003	<0.001	<0.001	<0.002	<0.041	<0.002	0.03	444
MW-1	T19N, R53E, S15	10/26/9	2.23	0.2	0.05	0.79	0.01	<0.002	<0.003	<0.003	<0.001	<0.001	<0.002	<0.041	<0.002	0.01	470
MW-1	T19N, R53E, S15	1/09/96	2.35	0.1	0.060	0.682	0.023	<0.002	<0.005	<0.003	<0.001	<0.002	<0.000	<0.001	<0.003	0.04	528
MW-2	T19N, R53E, S11	9/21/95	0.46	0.3	0.10	<0.04	0.04	<0.002	0.004	<0.003	0.002	0.008	<0.002	<0.041	<0.002	0.80	234
MW-2	T19N, R53E, S11	10/25/9	0.45	0.3	0.110	<0.04	0.05	<0.002	<0.003	<0.003	<0.001	0.005	<0.002	<0.041	<0.002	0.56	323
MW-2	T19N, R53E, S11	1/08/96	0.47	0.3	0.112	0.022	0.058	<0.002	<0.005	<0.003	0.002	0.005	<0.000	<0.002	<0.003	0.32	335
MW-3	T19N, R53E, S03	9/21/95	0.06	0.2	0.11	<0.04	0.08	<0.002	<0.003	<0.003	0.002	0.003	<0.002	<0.041	<0.002	0.90	403
MW-3	T19N, R53E, S03	10/25/9	0.05	0.1	0.10	<0.04	0.06	<0.002	<0.003	<0.003	<0.001	0.001	<0.002	<0.041	<0.002	0.70	508
MW-3 (dup.)	T19N, R53E, S03	10/25/9	0.05	0.1	0.10	<0.04	0.07	<0.002	<0.003	<0.003	0.001	0.001	<0.002	<0.041	<0.002	0.71	n/a
MW-3	T19N, R53E, S03	1/08/96	0.03	0.1	0.114	0.022	0.068	<0.002	<0.005	<0.003	0.004	0.007	<0.000	<0.001	<0.003	0.58	571
MW-4	T19N, R53E, S03	9/22/95	6.41	0.2	0.060	<0.04	0.120	<0.002	0.005	<0.003	0.005	0.002	<0.002	<0.041	<0.002	0.59	403
MW-4	T19N, R53E, S03	10/26/9	6.18	0.1	0.06	<0.04	0.12	<0.002	<0.003	<0.003	0.002	0.007	<0.002	<0.041	<0.002	0.71	580
MW-4	T19N, R53E, S03	1/09/96	6.44	0.1	0.076	0.007	0.129	<0.002	0.006	0.005	0.008	0.011	<0.000	0.001	0.004	0.94	594
Fad Shaft	T19N, R53E, S22	9/22/95	0.88	<0.01	0.040	<0.04	0.10	<0.002	<0.003	<0.003	0.002	<0.001	<0.002	<0.041	<0.002	0.19	410
Fad Shaft	T19N, R53E, S22	10/26/9	0.80	<0.1	0.05	<0.04	0.10	<0.002	<0.003	<0.003	0.002	<0.001	<0.002	<0.041	<0.002	0.18	530
Fad Shaft	T19N, R53E, S22	1/18/94	0.6	0.1	n/a	0.008	0.1	<0.000	<0.000	<0.02	0.0014	<0.01	<0.000	<0.001	0.000	0.24	n/a
Collingwood North well	T20N, R53E, S32	7/11/94	0.9	0.1	n/a	0.005	0.18	n/a	n/a	<0.02	n/a	<0.01	n/a	n/a	n/a	<0.0	n/a
Collingwood Old South well	T20N, R53E, S32	7/20/94	2.2	0.1	n/a	0.005	0.18	n/a	n/a	<0.02	n/a	0.01	n/a	n/a	n/a	<0.0	n/a
Rubio	T20N, R53E, S29	10/7/77	20.6	0.14	n/a	0.005	n/a	n/a	n/a	n/a	n/a	0.01	n/a	n/a	n/a	n/a	n/a
J. Minoletti	T20N, R53E, S32	10/15/8	235	0.08	n/a	<0.003	n/a	n/a	n/a	n/a	n/a	0	n/a	n/a	n/a	0.07	862
J. Minoletti	T20N, R53E, S32	2/29/88	123.4	0.09	n/a	<0.003	0.19	n/a	n/a	n/a	n/a	0	n/a	n/a	n/a	0.19	658
S. Oliver	T20N, R53E, S29	2/29/88	10.9	0.18	n/a	0.012	0.08	n/a	n/a	n/a	n/a	0	n/a	n/a	n/a	0.19	324
D. Sharrow	T20N, R53E, S34	2/29/88	4.5	0.23	n/a	0.006	0.13	n/a	n/a	n/a	n/a	0	n/a	n/a	n/a	0.1	385
L. Melka	T19N, R53E, S14	9/7/86	n/a	n/a	n/a	0.13	n/a	n/a	n/a	n/a	n/a	n/a	n/a	0.014	n/a	n/a	n/a
B. Melka	T19N, R53E, S14	3/10/87	53.5	0.26	n/a	0.09	0.08	n/a	n/a	n/a	n/a	0	n/a	n/a	n/a	0.22	1320
B. Melka	T19N, R53E, S14	3/30/83	41.1	0.26	n/a	0.08	0.08	n/a	n/a	n/a	n/a	0	n/a	n/a	n/a	1.31	n/a

Table 3.4-5 (Continued)

Sample Identification	Location	Date	Nitrate	Fluoride	Boron	Arsenic	Barium	Cadmium	Chromium	Copper	Lead	Manganese	Mercury	Selenium	Silver	Zinc	Conductivity
			mg/L														(umhos/cm)
Water Quality Standard			**10**[1]	**2.0**[2]**-4.0**[3]	--	**0.05**[1]	**2**[1]	**0.005**[1]	**0.1**[1]	**1.0**[2]	**0.05**[1]	**0.05**[2]	**0.002**[1]	**0.05**[1]	**0.1**[2]	**5.0**[4]	--
Canonie 1994																	
HRH-458 @ 985'[6]	--	5/28/94	1.0	0.16	n/a	0.017	0.14	<0.01	<0.025	<0.02	<0.1	n/a	<0.000	<0.001	<0.02	0.04	430
HRH-386 @ 925'[6]	--	5/18/94	0.9	0.2	n/a	0.024	0.11	<0.01	<0.025	0.02	0.10	n/a	<0.000	<0.001	<0.02	0.22	460
HRH-251 @ 780-790'	--	5/19/94	4.0	0.2	n/a	0.84	0.87	0.02	<0.025	<0.02	<0.05	n/a	0.0016	<0.001	<0.02	0.04	360
HRH-512[6]	--	5/11/94	4.5	0.1	n/a	0.039	0.23	0.0067	<0.025	<0.02	0.017	n/a	<0.000	0.001	0.000	<0.0	450
Collingwood North Well	T20N, R53E, S32	7/11/94	0.9	0.1	n/a	0.005	0.18	n/a	n/a	<0.02	n/a	<0.01	n/a	n/a	n/a	<0.0	n/a
Fad Shaft	T19N, R53E, S22	1/18/94	0.6	0.1	n/a	0.008	0.1	<0.000	<0.05	<0.02	0.0014	0.02	<0.000	<0.001	0.000	0.24	n/a
Fad Shaft- 800 tap[4]	T19N, R53E, S22	1/21/53	2.6	0.0	0.06	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	467
Holly Shaft- W8[4]	--	6/6/49	n/a	n/a	0.15	n/a	n/a	n/a	n/a	0.03	0.03	n/a	n/a	n/a	0.01	0.0	n/a

n/a = not available
[1]Federal secondary water quality standard.
[2]Nevada primary water quality standard.
[3]Nevada secondary enforceable water quality standard.
[4]Qualitative.
[5]Laboratory pH value.
[6]Sample not filtered; concentrations may be elevated.

Source: WMC 2004.

Table 3.4-6
Mine Area Groundwater Chemistry

Parameter[1]	Nevada Drinking Water Standards	MW-1 5/13/03	MW-2 5/13/03	MW-3 7/22/03	MW-4 4/22/03	MW-5 7/22/03	MW-6 4/21/03	MW-7 7/22/03	Fad Shaft 8/30/99	PW-1 12/9/03	PW-1 1/6/04	HRH-1737 11/12/03	North Collingwood 11/20/02	South Collingwood 11/20/02	Minoletti 2/29/88
pH (standard units)	6.5 – 8.5	8.5	8.12	7.98	7.98	7.63	8.22	8.03	8.02	7.89	7.91	8.04	7.59	7.67	7.85
TDS	500 – 1,000	249	245	304	309	227	196	205	246	266	235	209	230	210	400
WAD[2] Cyanide	0.2	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	--	<0.01	<0.01	--
Alkalinity	--	151	143	264	138	148	138	147	206	165	162	130	184	178	202
Bicarbonate	--	142	143	264	138	148	138	147	--	165	162	130	184	178	202
Boron	--	<0.04	0.098	0.096	<0.04	<0.04	0.07	<0.04	0.034	<0.04	0.05	<0.04	<0.1	<0.1	--
Calcium	--	45.8	26.7	28.9	38.6	35.3	32.3	32.3	60.2	47.9	49.0	39.9	50	50	64
Magnesium	125 – 150	18.3	11.6	44.9	20.8	20.2	18.0	20.4	28.7	16.2	16.2	12.2	30	20	33
Potassium	--	1.8	8.4	2.5	2.1	1.5	2.3	1.4	<1.7	1.5	1.5	1.4	1	1	2
Sodium	--	11.9	23.7	22.2	19.8	8.80	14.2	6.7	10.8	11.6	11.6	2.65	8	8	12
Aluminum	0.05 – 0.2	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.024	<0.02	0.03	<0.02	<0.02	0.089	--
Antimony	0.006	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.001	<0.003	<0.003	0.189	<0.003	<0.003	--
Beryllium	0.004	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	--
Chloride	250 – 400	29.9	4.68	5.30	42.0	14.7	19.2	6.78	9.7	16.6	18.5	5.12	4	4	27
Fluoride	2 – 4	0.12	0.37	0.19	0.15	<0.1	0.20	<0.1	<0.1	0.13	0.18	0.18	<0.1	<0.1	0.09
Nickel	0.1	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.023	<0.01	<0.01	<0.01	<0.02	<0.02	--
Nitrite + Nitrate	10	1.71	0.48	0.02	7.78	1.97	2.17	2.19	0.74	1.20	1.08	0.06	<1	<1	--
Sulfate	250 – 500	18.1	22.7	48.4	18.1	26.3	20.4	23.5	40.4	28.6	29.7	27.4	20	10	18
Arsenic	0.05	0.197	0.024	<0.01	<0.01	0.082	<0.01	<0.01	<0.04	<0.01	0.011	0.022	<0.005	<0.005	<0.003
Barium	2	0.0539	0.0611	0.063	0.137	0.119	0.082	0.0813	0.113	0.0988	0.103	0.037	0.176	0.181	0.19
Cadmium	0.005	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.0024	<0.002	<0.002	<0.002	<0.002	<0.002	--
Chromium	0.1	<0.006	<0.006	<0.006	<0.006	<0.006	<0.006	<0.006	0.006	<0.006	<0.006	<0.006	<0.005	<0.005	--
Copper	1.3	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.01	<0.01	--
Iron	0.3 – 0.6	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	0.13	0.38
Lead	0.015	<0.005	<0.005	<0.005	0.0056	<0.005	<0.005	<0.005	0.007	<0.005	<0.005	<0.005	<0.007	<0.007	--
Manganese	0.05 – 0.1	0.029	0.0046	0.006	<0.002	<0.002	0.009	<0.002	<0.002	0.0055	0.0041	0.0578	<0.005	0.005	--
Mercury	0.002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0005	<0.0005	--
Selenium	.05	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.04	0.012	0.014	<0.01	<0.01	<0.01	--
Silver	0.1	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.006	<0.005	<0.005	<0.005	<0.01	<0.01	--
Thallium	0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.001	<0.002	<0.002	0.002	<0.001	0.002	--
Zinc	5	0.0979	0.222	0.961	0.603	2.00	0.204	0.868	0.311	0.0093	0.0117	0.064	<0.05	<0.05	0.19

[1] Values are reported in mg/L unless otherwise noted.
[2] WAD = weak acid dissociable.

Source: WMC 2004.

wells in the vicinity of the project area. WESTEC sampled four monitoring wells completed in bedrock within the limits of the proposed mine expansion area. Two of these wells are located upgradient of the proposed pit expansion, while two are located downgradient (one below the proposed leach pad expansion and one below the proposed East Waste Rock Disposal Area expansion). Canonie Environmental (1994) also presented chemistry of samples from drill holes in the project area. Water from the Fad and Holly shafts, which were completed in the bedrock aquifers in the foothills south of Diamond Valley in the late 1940s and early 1950s, also were sampled. WMC (2004) sampled Homestake's monitoring wells in the project area and reviewed Homestake monitor well results for the period of 1997 to 2004.

Canonie Environmental (1994) found that the water chemistry of the bedrock and alluvial aquifers were very similar and concluded that the two aquifers are part of the same hydrologic system. Bicarbonate is the major anion for all but two samples, and calcium tends to be the predominate cation. Wells located in areas of discharge within Diamond Valley that are affected by evaporation do not fit this pattern (i.e., two wells north of the project area).

Most of the samples analyzed contained concentrations of constituents that were within most Nevada water quality standards, with some exceptions. Most of the domestic wells contained nitrate concentrations higher than 10 mg/L; these high concentrations (10.9 to 235 mg/L) most likely were related to nearby septic leach fields, cropland (agricultural fertilizer), and/or livestock areas. The Melka well, located east of the project area, had an average arsenic concentration of 0.1 mg/L (Canonie Environmental 1994).

Groundwater quality sampling conducted by WMC (2004) found that groundwater in the Ruby Hill Mine area was mainly calcium bicarbonate water with TDS values below 400 mg/L. Groundwater from the pumping of well PW-1 (used in a 45-day aquifer test in the Archimedes Block) was within Nevada drinking and stock water limits for all constituents. Groundwater from the North and South Collingwood wells and the Minoletti well in the valley alluvium to the north of the mine site was within Nevada drinking and stock water standards for all Nevada Profile II constituents, and was characterized by a pH in the range of 7.5 to 7.8 and TDS of 400 mg/L or less (WMC 2004). It also was calcium bicarbonate water. Groundwater quality in the carbonate bedrock of the mine site was within Nevada drinking and stock water standards for most constituents, arsenic in the mine area being the only exception with values up to 0.84 mg/L.

3.4.2 Environmental Consequences

The primary issues for water resources include the potential for: 1) a decline in water levels in either the alluvial or carbonate aquifers due to dewatering of the proposed East Archimedes Pit; 2) a rise in water levels in the alluvial aquifer of southern Diamond Valley due to infiltration or reinjection of groundwater pumped during pit dewatering; 3) water quality impacts to alluvial groundwater due to disposal of water pumped during pit dewatering; 4) formation of a post-mining pit lake in the proposed East Archimedes Pit; and 5) mobilization of dissolved constituents from the expanded waste rock piles.

3.4.2.1 Proposed Action

Rock types that would be encountered during mining include oxidized carbonate rock (22.2 percent), alluvium (68.9 percent), sulfide-bearing carbonate rock (0.9 percent), oxidized intrusive rock (5.9 percent), sulfide-bearing intrusive rock (1.5 percent), and volcanics (0.6 percent) (Homestake 2004b). Of these rock types, only the sulfide-bearing intrusive rock has a net neutralizing potential (NNP) less than 20 tons of calcium carbonate per kiloton of mined material and thus is potentially acid generating. Since sulfide-bearing intrusive rock is a small percentage (approximately ***1.5*** percent) of the total waste rock that would be generated and placed in the expanded waste rock disposal facilities, and since this rock would be intermixed with rock with a high carbonate content and high NNP, the waste rock in the expanded waste rock disposal facilities is not expected to be acid generating.

Surface Water Impacts

Surface Water Quantity. The proposed mine expansion is not expected to have a substantial impact on surface water resources due to the absence of perennial streams in the project area. The proposed mine expansion would affect intermittent drainages in the area of the pit expansion due to removal of intermittent stream segments during construction of the East Archimedes Pit. As discussed in the Ruby Hill Project Final EIS (BLM 1997a), the intermittent drainages in the mine area were determined by the USACE to be non-jurisdictional WUS. Also as discussed in the Ruby Hill Project Final EIS (BLM 1997a), the nearest seep is located 0.75 mile from the project site, and springs are located greater than 1 mile from the project. All springs and seeps previously identified within 3 miles of the mine site are above the groundwater table and are upgradient of the proposed mine expansion. Thus, no impacts to seeps or springs are expected from mining, pit dewatering, or waste rock disposal.

Surface Water Quality. As discussed in Section 2.3.14, Applicant-committed Environmental Protection Measures, Homestake has committed to maintaining or constructing diversion channels around project-related disturbance areas. The diversions would be designed to divert flows from a 100-year, 24-hour storm event. Implementation of erosion control measures (e.g., silt fences, straw bale barriers, etc.), outlined in the mine’s SWPPP, and concurrent reclamation would minimize runoff and sedimentation. As a result, sedimentation effects on surface waters would be minimal. In addition, no impacts to surface water quality are anticipated in association with the proposed expansion of the waste rock disposal areas based on the proposed reclamation procedures that would be implemented.

Waste Rock Management

Approximately 190 million tons of waste rock would be generated by the mining of the proposed East Archimedes deposit. The ore consists of disseminated gold in oxidized limestones of the Goodwin Formation. Some sulfide-bearing rock exists in the deposit below the water table. These are sulfide-bearing carbonate rock, which accounts for approximately 0.9 percent of the rock that would be mined, and sulfide-bearing intrusive rock, which accounts for approximately 1.5 percent of the rock that would be mined (Homestake 2004b). As a result, the waste rock primarily would consist of non-sulfide bearing rock and is not anticipated to be acid generating. **Table 3.4-7** gives the percentages of rock types in the waste rock that would be mined.

Acid-base accounting (ABA) tests have been conducted on rock samples considered to be representative of the rock types found in the existing West Archimedes Pit and those expected in the proposed East Archimedes Pit. **Table 3.4-7** summarizes the results of these tests and includes tests conducted for the Ruby Hill Final EIS (BLM 1997***a***) as well as those conducted for this SEIS. Of 123 samples tested, only 11 were potentially acid generating with negative NNP values. All of the other samples had NNP values above 20 tons per kiloton (T/kT). The potentially acid generating samples were sulfide-bearing intrusive rock.

Table 3.4-7
Acid Base Accounting Test Results

Rock Type	Number of Samples	Proportion of Waste Rock (percent)	Proportion of Highwall Area (percent)	Paste pH (standard units)	Acid Neutralization Potential (tons/1,000 tons)	Acid Generation Potential (tons/1,000 tons)	Net Neutralization Potential (tons/1,000 tons)
Oxide Carbonate	35	22.2	45.6	8.3	602	0.4	601
Alluvium	48	68.9	40.2	8.5	624	0.3	624
Sulfide Carbonate	14	0.9	3.0	7.3	320	70	250
Oxidized Intrusive	12	5.9	7.5	ND	28.3	1.4	27.0
Sulfide Intrusive	11	1.5	2.9	ND	56.6	60.5	-3.8
Volcanics	3	0.6	0.8	ND	80	0.5	79
Weighted Average	**--**	**--**	**--**	**--**	**539**	**4.2**	**535**

ND = not detectable.

Source: Homestake 2004b; Schafer 2004.

Schafer (2004) conducted geochemical tests on samples specific to the proposed East Archimedes Pit. ***These*** tests included ABA tests, humidity cell tests, and meteoric water mobility procedure (MWMP) tests on rocks expected to be representative of waste rock generated during the mining of the East Archimedes Pit. Schafer's test results are presented in appendices to his report (Schafer 2004). Of the 72 samples that had ABA tests, only 2 samples had negative NNP values. All other samples had NNP values greater than 20 T/kT and thus were not considered to be potentially acid generating. Schafer (2004) ran humidity cell tests on the sulfide-bearing intrusive rock, the rock type with negative NNP values. The humidity cell tests showed that after 24 weeks, the pH was 2.9 standard units, arsenic was 2.86 mg/L, thallium was 0.254 mg/L, zinc was 74 mg/L, aluminum was 17.2 mg/L, cadmium was 0.054 mg/L, iron was 119 mg/L, sulfate was 707 mg/L, and the TDS was 1,020 mg/L. Some of these values (i.e., arsenic, cadmium, zinc, and pH) exceeded Nevada irrigation and stock water standards. However, sulfide-bearing rock would account for less than 3 percent of the waste rock to be mined and is not expected to produce any measurable acid rock drainage due to the high neutralizing capacity of the carbonate rock and alluvium, which would be the predominate waste rock types mined.

MWMP tests were run on 24 samples considered representative of the rock types expected to be mined and part of the waste rock (Schafer 2004). Test results showed that the carbonate rock could have arsenic as high as 0.072 mg/L and mercury up to 0.014 mg/L; however, these elevated values were found in only a few samples. Similarly, the alluvium samples had arsenic up to 0.216 mg/L, but most samples were below 0.05 mg/L. Similar MWMP tests reported in the Ruby Hill Project Final EIS (BLM 1997***a***) showed that the sulfide-bearing limestone could have pH values between 3.7 and 6.5 standard units, TDS values up to 4,350 mg/L and generally above 700 mg/L, sulfate values up to 2,650 mg/L with most values above 400 mg/L, cadmium up to 17.3 mg/L, and zinc up to 590 mg/L with most values between 0.1 and 0.6 mg/L. Mercury in one sample was 0.021 mg/L, and arsenic was between 0.059 and 0.095 mg/L. MWMP tests provide only a general guide to possible effluent water quality from rain water contacting rock. Actual effluent water quality from bare waste rock that has been infiltrated by rain water or snow melt would depend on the grain size of the waste rock fragments, the overall composition of the waste rock, and the length of time the water contacts the rock.

The geochemical tests conducted on potential waste rock from the proposed East Archimedes Pit suggest overall that: 1) only the sulfide-bearing intrusive rocks could be potentially acid generating; 2) arsenic values in any effluent seepage from waste rock due to rain water that may contact the waste rock should be within Nevada stock water and irrigation standards; and 3) only the sulfide-bearing rocks, which comprise less than 3 percent of the total waste rock, would have the potential to generate seepage elevated in sulfate and metals. These results are similar to the waste rock studies documented in the Ruby Hill Project Final EIS (BLM 1997***a***). Thus, the waste rock from the pit expansion should have similar potential impacts to surface water quality as the waste rock in the existing waste rock piles. Over the past 7 years, no seeps have been noted associated with waste rock stored at the Ruby Hill Mine. During concurrent reclamation, waste rock disposal areas would be covered with growth media and reseeded; water subsequently would not be expected to contact waste rock. Thus, acidic or metal-laden seeps are not expected from the proposed waste rock expansion related to the mining of the proposed East Archimedes Pit.

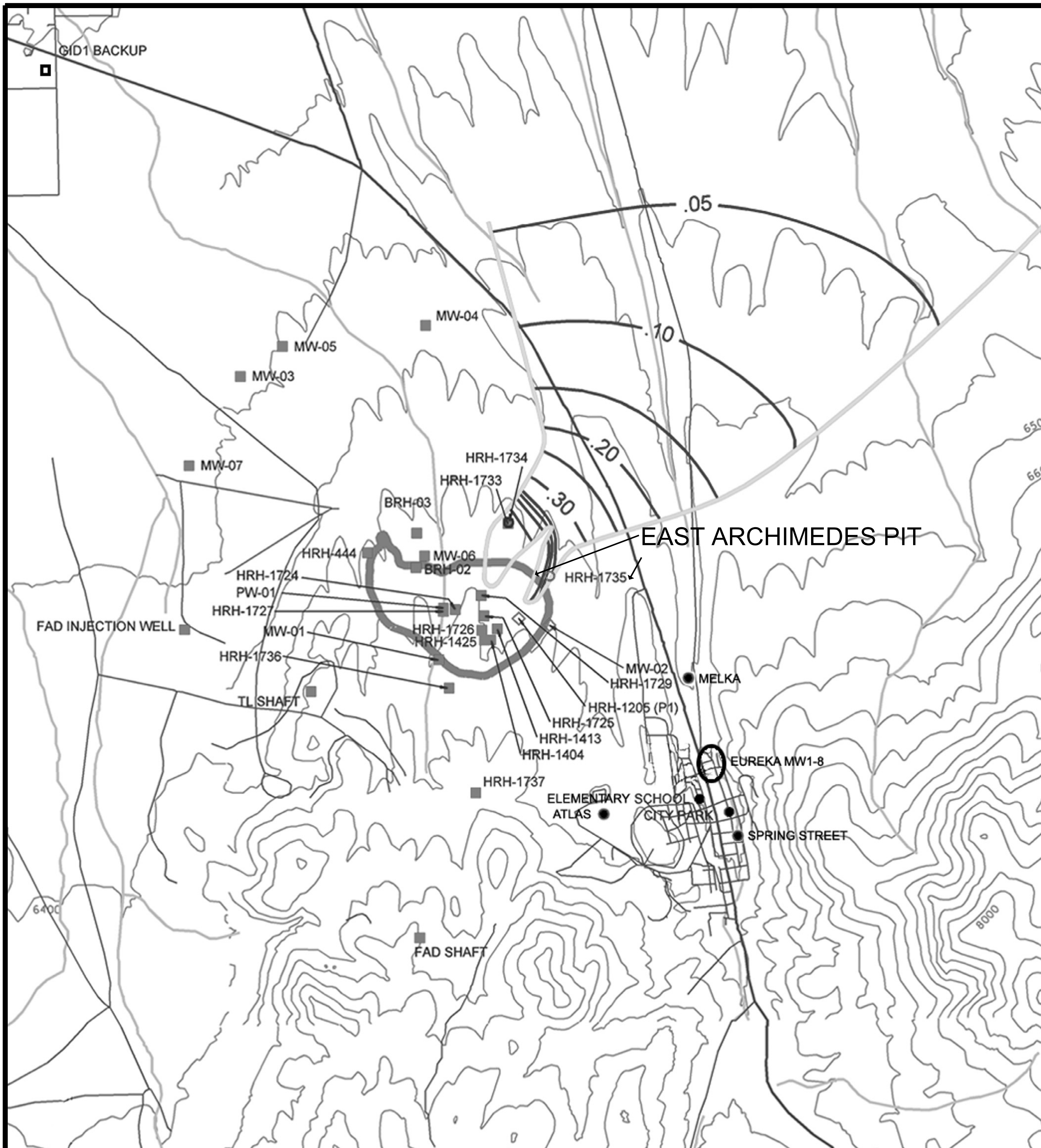
<u>Groundwater Impacts</u>

Potential groundwater impacts related to the mining of ore in the East Archimedes Pit would include the effects of pit dewatering and reinjection/infiltration of the groundwater removed during pit dewatering operations.

Groundwater Quantity. Homestake proposes to dewater the East Archimedes Pit during mining by pumping approximately 500 to 1,000 gpm of groundwater from the carbonate bedrock for a period of 7 years using at least four separate dewatering wells screened in major fracture systems of the East Archimedes Pit area (Jones 2004). An estimated average dewatering rate of 860 gpm was obtained by Homestake using a pilot 45-day pumping test (WMC 2004) and a numerical groundwater model to project the results of the pilot test over the life of mine, which would be approximately 7 years (Jones 2004). Dewatering is projected to lower the water level in the carbonate bedrock, mainly in the Goodwin Formation in the Archimedes Block, from 5,910 feet amsl to 5,330 feet amsl over the 7-year period. The average pumping rate of 860 gpm would keep the pit dry for the life of mine. Pumping rates as high as 1,000 gpm may be needed at times to maintain the water level in the carbonate bedrock below the mine pit (Jones 2004).

Figure 3.4-5 shows the extent of the projected 10-foot drawdown contour under the proposed dewatering/reinjection scenario after 7 years of dewatering at an average rate of 860 gpm, and **Figure 3.4-6** shows the extent of the projected 10-foot groundwater drawdown under the proposed dewatering/infiltration basin scenario. This drawdown contour would extend out approximately 2 miles to the northeast from the proposed East Archimedes Pit and mainly would be in the alluvial aquifer. To the south, the 10-foot drawdown contour would be in the carbonate bedrock and would extend to just south of the Fad Shaft, which is still within the Ruby Hill Mine boundary. Known wells within the 10-foot drawdown contour for pit dewatering are identified in **Table 3.4-4** and **Figures 3.4-5** through **3.4-8**. These wells are within or near the town of Eureka and would experience a drawdown up to 20 feet after 7 years of dewatering. No related impacts to irrigation wells in the southern part of Diamond Valley are anticipated.

It is projected that the town of Eureka, Nevada, would experience 10 to 20 feet of groundwater drawdown in the bedrock aquifer beneath the town as a result of mine dewatering. However, due to the type of geologic



Legend

- Monitoring wells recent alluvium
- Monitoring wells older alluvium
- Monitoring wells volcanic rock
- Monitoring wells carbonate rock
- Known producing wells
- Subsidence contour, feet
- Extent of saturated alluvium

Note: Eureka MW 1-8 represents a cluster of shallow monitoring wells.

Source: Jones 2004.

N W E S

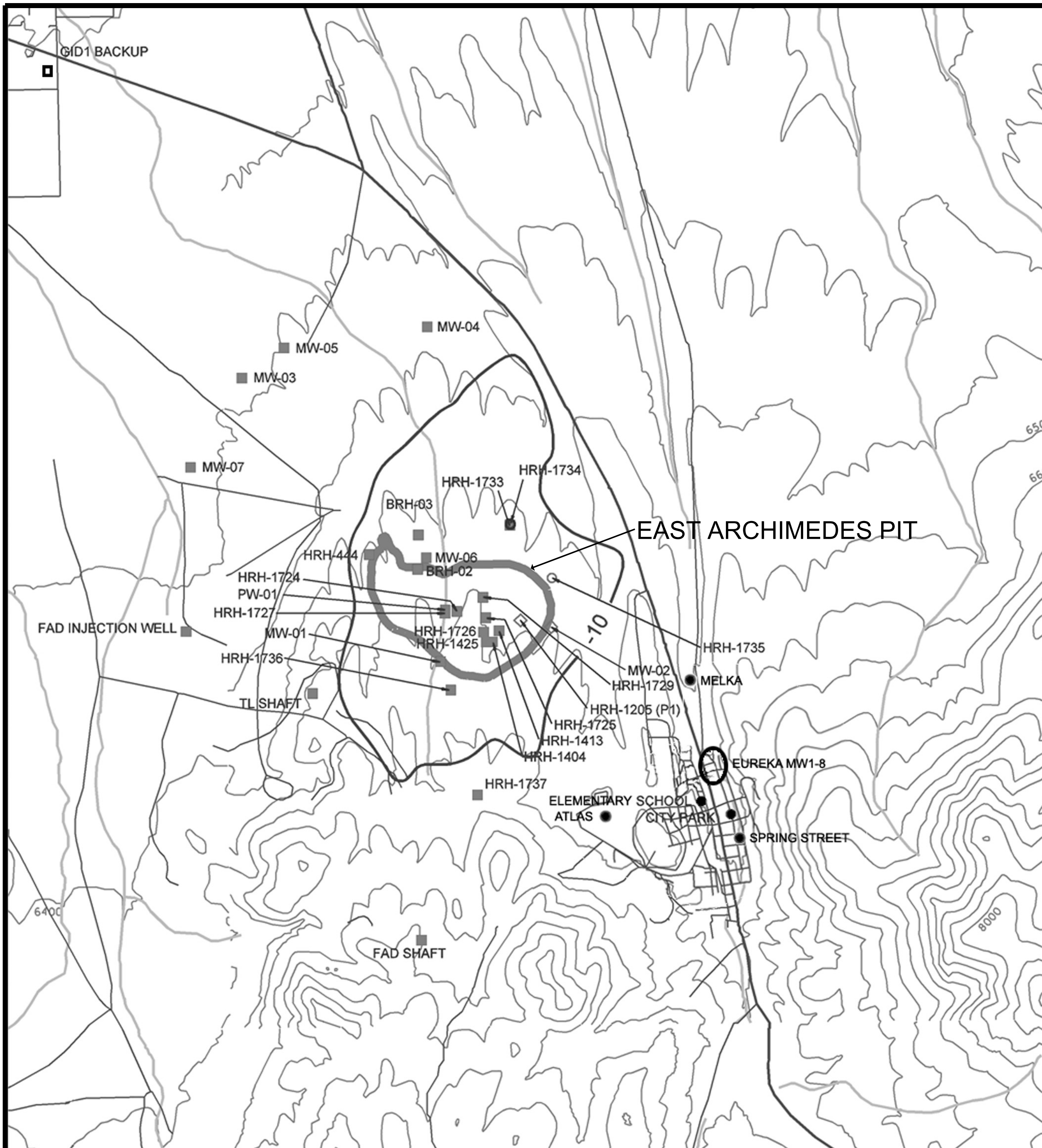
0 .5 1 Mile

Ruby Hill Mine Expansion

Figure 3.4-7

Projected Maximum Subsidence

01/26/05



Legend

- Monitoring wells recent alluvium
- Monitoring wells older alluvium
- Monitoring wells volcanic rock
- Monitoring wells carbonate rock
- Known producing wells

Note: Eureka MW 1-8 represents a cluster of shallow monitoring wells.

Source: Jones 2004.

Ruby Hill Mine Expansion

Figure 3.4-8

Projected 10-foot Drawdown Area at Post-recovery

01/26/05

material under the town (volcanic and carbonate bedrock), no subsidence-related effects would be anticipated in this location.

Jones (2004) evaluated the potential for land subsidence due to mine dewatering and the anticipated associated groundwater drawdown. Based on this evaluation, potential ground subsidence could occur primarily in the Archimedes Block, which is crossed by U.S. Highway 50 north of Eureka, Nevada (see **Figure 3.4-7**). Along this section of highway, the evaluation determined that the maximum potential subsidence could range between 0.10 and 0.25 foot. The effects of subsidence on facilities located within the potentially affected area would depend on the actual amount of subsidence, specific geologic material in the area of effect (alluvium), and the type of facility (i.e., road, pipeline, transmission line, etc.) affected. ***Subsidence is not expected beneath the Eureka town site due to the hydrologic isolation of the bedrock volcanic block that lies beneath the town (WMC 2005). Drawdown in the Archimedes block should have only minimal impact on water levels in bedrock beneath Eureka.***

Groundwater pumped during dewatering of the proposed East Archimedes Pit in excess of mine water demands would be returned to the shallow alluvial aquifer of southern Diamond Valley via reinjection or infiltration. For reinjection, excess water would be reinjected into the North and South Collingwood wells (**Figure 3.4-5**) at an approximate rate of 645 gpm. **Figure 3.4-5** shows the temporary groundwater mound that would form in the shallow alluvial aquifer by the end of mining as a result of reinjection. This groundwater mound mainly would affect the area to the southwest of the Collingwood wells, and the 10-foot contour for the mound would extend approximately 7,000 feet to the southwest from the Collingwood North well. Reinjection of water from pit dewatering into the Collingwood wells could affect producing wells in T20N, R53E, Sections 29, 30, and 32. The wells in Section 32 could see a temporary rise in the alluvial water table of 40 to 50 feet over the proposed 7-year period of reinjection. Wells in Section 29 and 30 would see a rise in the water table of 10 feet or less. Following the completion of reinjection, the groundwater mound would subside. ***Groundwater quality in the alluvial aquifer is not expected to be affected by reinjection of water from the dewatering of the East Archimedes Pit, because the water quality of the reinjected water and the groundwater in the alluvial aquifer are expected to be similar for all constituents.***

For infiltration, an infiltration basin would be constructed in the northernmost existing soil borrow pit in Spring Valley to return excess dewatering water to the shallow alluvial aquifer in southern Diamond Valley. Under this scenario, water would be sent to the infiltration basin at an approximate rate of 648 gpm. **Figure 3.4-6** shows the temporary groundwater mound that would form by the end of mining due to infiltration of water through the basin in Spring Valley. This groundwater mound would affect the area to the south and west of MW-7 in Spring Valley. ***Groundwater quality in the alluvial aquifer is not expected to be affected by infiltration of water through the rapid infiltration basins based on percolation tests conducted by McClelland Laboratories (2005).***

Jones (2004) projected that, with the dewatering wells shut down following the completion of mining, the water table in the carbonate bedrock would recover, and the 10-foot groundwater drawdown contour would move inward and reach a steady-state position within the mine boundary as shown in **Figure 3.4-8**. This recovery probably would occur over a period of approximately 40 years after mining as the pit fills with water and reaches approximately 95 percent of the final pit lake water level. In the shallow alluvial aquifer, cessation of groundwater reinjection and/or infiltration would allow for dissipation of the groundwater mound formed during operation. The time for dissipation of the groundwater mound is estimated at approximately 10 to 20 years.

Groundwater Quality. Analyses of the groundwater samples collected during the 45-day pilot pump test conducted by WMC (2004) showed that the water was within Nevada drinking water and stock water standards. Monitor wells in the vicinity of the mine generally have water quality within Nevada drinking water and stock water standards. Thus, near-surface water quality in the mine area suggests that the water pumped and reinjected/infiltrated during dewatering of the East Archimedes Pit should be within Nevada drinking water and stock water standards. The quality of groundwater that would be pumped during the approximately 7 years of dewatering of the East Archimedes Pit is uncertain. The groundwater would come from deeper depths as pumping progressed and also would be drawn into the pit area from distances farther out from the pit as the water level beneath the pit declined. The uncertainty of the water quality of the deeper carbonate aquifers increases with pit depth and time.

As discussed in Section 2.3.6.1, Heap Leach Design and Construction, the heap leach expansion area would be designed to be a zero-discharge facility with the capacity to contain all process fluids and meteoric waters generated by a 25-year, 24-hour storm event. The system also would be designed to contain a 24-hour draindown resulting from power loss. Storm flows from upgradient catchment areas would be routed around the facility by a diversion ditch system designed to pass the 100-year, 24-hour storm event. The leach pad expansion would be constructed with a composite liner with a leak detection system that would include separate monitoring systems for each cell. Therefore, contamination of groundwater by leach solution is not anticipated.

As discussed in Section 2.3.15.8, Facility Reclamation, the reclamation phases for the heap leach pad expansion area would include heap draindown; heap regrading, resoiling, and revegetation; solution management; and pond reclamation. Two years prior to closure, a detailed permanent closure plan for the expanded heap leach facilities would be submitted to the NDEP for approval. It is anticipated that the draindown solution disposal plan would combine enhanced evaporation and a contained, NDEP-approved land application system with enhanced evaporative spray nozzles installed on the heap application spray system. This system would include recirculation of solutions back onto the heap to evaporate solutions. Evaporative nozzles also may be used on the solution ponds to further accelerate evaporation of solutions.

Pit Lake Formation

Following the completion of mining and pit dewatering, the East Archimedes Pit partially would fill with water. Over a period of approximately 40 years, the water level in the pit would rise to approximately 5,835 feet amsl. It is anticipated that it would take approximately 100 years for the pit lake to reach a predicted final steady-state level of 5,861 feet amsl. At that time, groundwater inflow would be approximately 92 gpm, and evaporation from the pit lake surface would be approximately 142 gpm (Jones 2004). The difference of 50 gpm would be made up by precipitation and highwall runoff. The pit lake would be a terminal pit lake (i.e., no outflow) and, thus, would act as a groundwater sump.

The expected water quality in the East Archimedes Pit lake was modeled by Schafer (2004) using geochemical tests on simulated pit lake water and the USGS geochemical modeling code PHREEQC (Parkhurst and Appelo 1999). Pit lake geochemical modeling is a complex process that involves assumptions about the quantity and quality of waters flowing into the pit over time, the chemical reactions that occur in the pit lake over time, which solid phases precipitate, the reaction between metals and solid phases, and the amount of carbon dioxide and oxygen in the pit lake waters at various depths. The geochemical tests and pit lake geochemical modeling by Schafer (2004) are summarized below.

Pit Lake Conceptual Model. The factors that affect pit lake water quality are: 1) the quantity and quality of waters flowing into the pit lake; 2) the evaporation rate from the pit lake; 3) precipitation (i.e., rainfall) amounts and runoff water quality; 4) precipitation of solids due to chemical reactions in the pit lake; and 5) stratification of the lake. **Table 3.4-8** shows the representative water types used in the pit lake modeling by Schafer (2004) and how they were simulated in the geochemical model. **Figure 2-4** shows a schematic cross-section of the rock types expected in the final pit highwall. Precipitation was set at the average value of 11.74 inches per year, and lake evaporation was set at 45 inches per year in the model. Three stages of filling were modeled by Schafer (2004): 1) 40 percent filling, which would occur at approximately year 5; 2) 90 percent filling, which would be at approximately year 30; and 3) 99 percent filling, which would be at approximately year 99.

Table 3.4-8
Representative Waters for Pit Lake Water Quality Prediction

Source	Description	Representative Waters
Precipitation	Natural rainfall that falls directly into the pit lake	Distilled de-ionized water
Groundwater inflow through highwall and pit floor	Groundwater, predominantly flowing through carbonates, that enters the pit through weathered rock exposed in the highwall	A combination of groundwater from selected wells completed in the carbonate bedrock aquifer and samples from the first flush of water through the saturated columns for the oxidized carbonate and mineralized (e.g., ore grade) oxidized carbonate
Highwall runoff and interflow	Meteoric water that runs off of the highwall or that infiltrates into the highwall and then migrates as interflow	Water samples derived from various stages of leaching from unsaturated columns or a mixture of water samples derived from the unsaturated columns and distilled water
Evaporation	Evaporation of water from the pit lake surface, without any attendant chemical flux	Volume reduction of mixture of representative waters by evaporation

Source: Schafer 2004.

Assumptions used in the modeling were based on the projected pit geometry at the end of mining and included the following: 1) the pit highwall would consist mainly of oxidized limestone below 5,900 feet amsl elevation; 2) alluvium would constitute the highwall above approximately 6,100 feet amsl; and 3) approximately 33 percent of the final pit would be covered by the pit lake. Rocks exposed in the pit highwall below the final water level, which would affect the chemistry of groundwater flowing into the pit, would be oxidized limestones (66.6 percent), oxidized intrusives (16.7 percent), sulfide limestones (6.9 percent), sulfide intrusives (5.8 percent), alluvium (2 percent), and volcanics (2 percent). The proportion of rocks expected in the highwall above the final water level, which would affect the chemistry of runoff water, would be alluvium (56.8 percent), oxidized carbonates (32.9 percent), oxidized intrusives (2.6 percent), backfilled waste rock (5.4 percent), and others (2.3 percent). Thus, the water quality of highwall runoff would be determined mainly by alluvium and oxidized limestones. The water quality of inflowing groundwater would be affected by oxidized limestones, oxidized intrusives, sulfide-bearing limestones, and sulfide-bearing intrusives.

Geochemical Tests. Geochemical tests were conducted on the rock types that would be in the final pit highwall in order to determine the effect of these rock types on the quality of waters that may flow over the rocks (highwall runoff) or flow through the rocks (groundwater inflow). The tests conducted included ABA, humidity cells (or kinetic tests), MWMP tests, and total metals and column tests. **Table 3.4-7** summarizes the ABA tests conducted by Schafer (2004). These tests show that only the sulfide-bearing intrusives have the potential to be acid generating. Humidity cell tests were run by Schafer (2004) and WESTEC (1996***d***) on the rock types that would be in the final pit highwall. These tests showed that only the sulfide-bearing intrusive rock type was acid generating and had the potential to release sulfate and metals. Metals of potential concern for the pit lake were arsenic, barium, thallium, and zinc. The range of metals found in the whole rock geochemical tests are summarized in **Table 3.4-9**. Not all of the metals detected in the whole rock geochemical tests would be easily leached by either rain water or groundwater. The MWMP tests are summarized in **Table 3.4-10**.

Table 3.4-9
Metal Values for Mineralized Rock Samples from the Ruby Hill Deposit

Metal[1]	Typical Background in Carbonate Rocks (mg/kg)[2,3]	Median	Minimum	Maximum
		Concentration (mg/kg)		
Arsenic	**1**	**179**	**11**	**4,000**
Boron	20	24	4.6	168
Barium	**10**	**349**	**10**	**4,370**
Cadmium	***0.03***	***2.0***	***<0.5***	***86***
Chromium	11	15	2.3	137
Copper	4	13	5.0	68
Fluoride	330	2.5	1.1	3
Mercury	***0.04***	***1.2***	***<0.2***	***171***
Nickel	20	6	2.1	76
Lead	**9**	**79**	**4.0**	**4,130**
Antimony	0.3	3.7	1.2	25
Selenium	0.9	3.2	0.2	21
Thallium	**No data**	**33**	**2.7**	**420**
Zinc	**20**	**240**	**23**	**11,700**

[1]Concentrations that are elevated more than10-fold above typical background concentrations are shown in bold.
[2]mg/kg = milligrams per kilogram
[3]Typical concentrations in carbonate rocks from Drever (1997).

Source: Schafer 2004.

As oxide limestone is the major rock type that would be found below the final pit lake elevation, it is anticipated that metals that could be leached from this rock type, such as arsenic, potentially would have measurable concentrations in the pit lake. Similarly, because alluvium and oxide limestone would dominate the pit highwall above the final pit lake, these two rock types should have the greatest influence on the water quality of highwall runoff.

Table 3.4-10
Results for Typical Limestone and Alluvium Samples
Meteoric Water Mobility Procedure

Concentration (mg/L)	Oxide Limestone[1]	Alluvium[1]	Sulfide Limestone[2]	Sulfide Intrusive[2]	Oxide Intrusive[2]
pH (standard units)	7.9	8.2	6.3	6.4	7.5
Total Dissolved Solids	63	174	2,256	348	183
Calcium	11	15	341	29	14
Magnesium	3.4	8.8	59	13	7.4
Sodium	3.3	24	17	8.5	19
Potassium	0.18	1.96	11	25	16
Alkalinity as Calcium Carbonate	35	77	79	11	34
Bicarbonate	34	76	79	11	34
Chloride	3.9	18.1	19.9	4.5	12.7
Fluoride	0.15	0.78	1.85	0.4	0.75
Arsenic	0.04	0.039	0.207	0.016	0.039
Barium	0.108	0.096	0.14	0.17	0.26
Boron	0.084	0.127	NA	NA	NA
Lead	<0.003	<0.007	1.36	0.002	0.026
Thallium	<0.001	<0.001	0.015	0.009	<0.001
Zinc	<0.004	<0.05	197.1	0.18	0.4

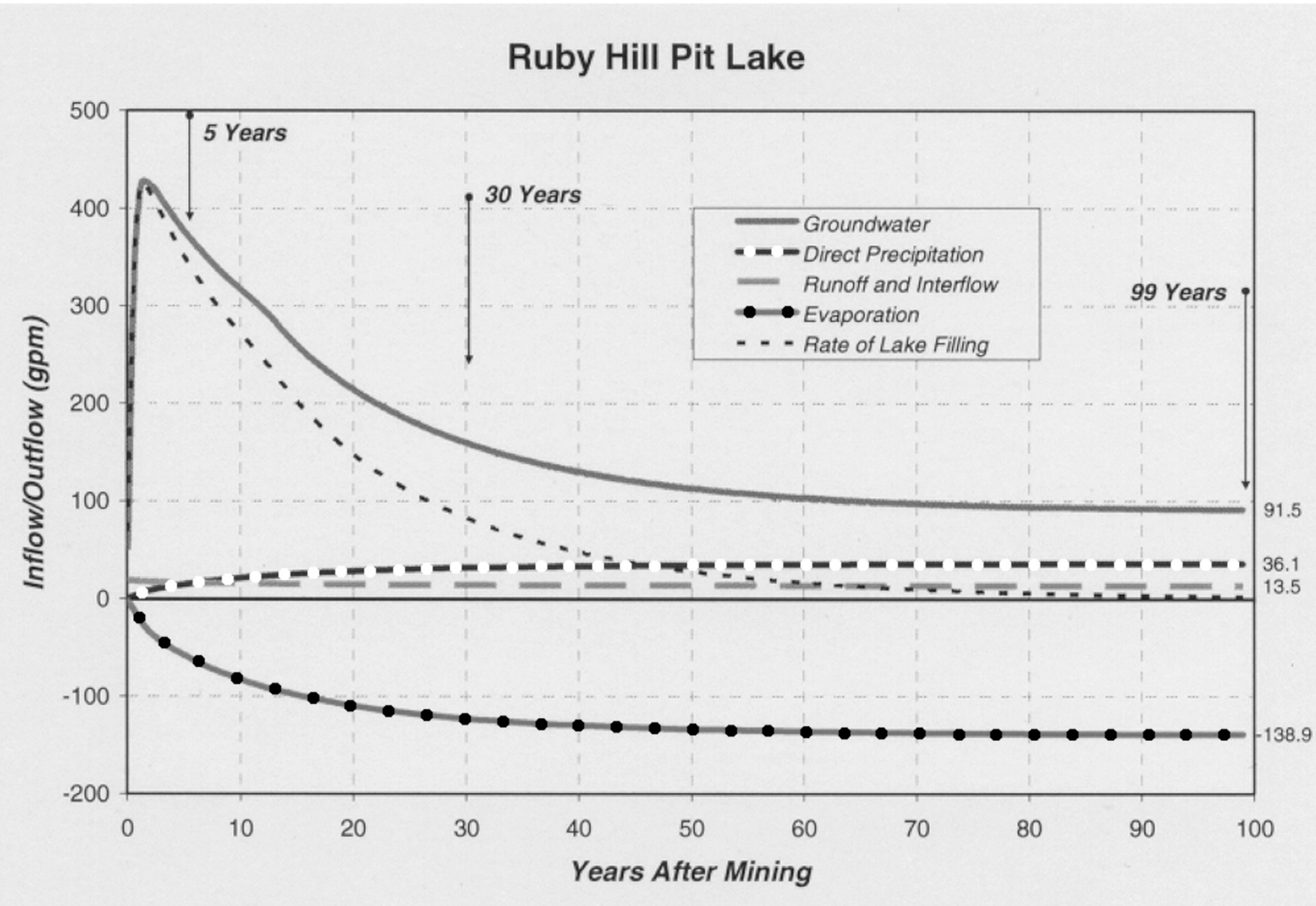
[1]Results from Ruby Hill based on analysis of 12 oxidized limestone and 12 alluvium samples.
[2]Results from SMI (1997), Scanlan (1994), and WESTEC (1996***d***) based on analysis of 4 sulfide limestone, 4 sulfide intrusive, and 6 oxide intrusive samples.

Source: Schafer 2004.

Schafer (2004) also ran column leach tests to simulate the flow of water through saturated rock types to simulate groundwater inflow, and through unsaturated rock types to simulate flow of water over the pit highwall rock types. In summary, the tests showed that arsenic is predicted to remain within the range of 0.03 to 0.05 mg/L during flushing of the oxide limestone but would increase from 0.027 to 0.091 mg/L in the flushing of the unsaturated alluvium. Barium is predicted to increase from 0.14 to 0.22 mg/L in the flushing of the oxide limestone and would increase from 0.035 to 0.125 mg/L in the flushing of the unsaturated alluvium.

Pit Lake Water Balance and Mass Loading Model. The water balance used by Schafer (2004) for modeling the pit lake evolution in the proposed East Archimedes Pit is shown in **Figure 3.4-9**. Groundwater initially would flow into the pit at a rate of approximately 425 gpm. By year 30, the groundwater inflow rate would be down to approximately 150 to 170 gpm, and by year 99 the groundwater inflow rate would reach an approximate steady-state value of 92 gpm. Precipitation falling on the pit lake initially would be quite low, because the pit lake would have a small surface area. By year 99, the precipitation influx would be approximately 36 gpm, and the pit lake would have a surface area of approximately 59.7 acres. Highwall runoff initially would be approximately 18.9 gpm and would decrease to approximately 13.5 gpm over time as the pit lake reached steady-state in approximately year 99.

Direct rainfall was modeled as distilled and de-ionized water and would account for 2.3 percent of the inflow of water in year 5 and 15.58 percent in year 99. Highwall runoff accounts for 4.3 percent of the water inflow in year 5 and increases to 7 percent by year 99. The largest single contributor to inflow would be groundwater inflow that mixes with the first flush of constituents from the weathered highwall rocks. This



Source: Schafer 2004.

Ruby Hill Mine Expansion

Figure 3.4-9

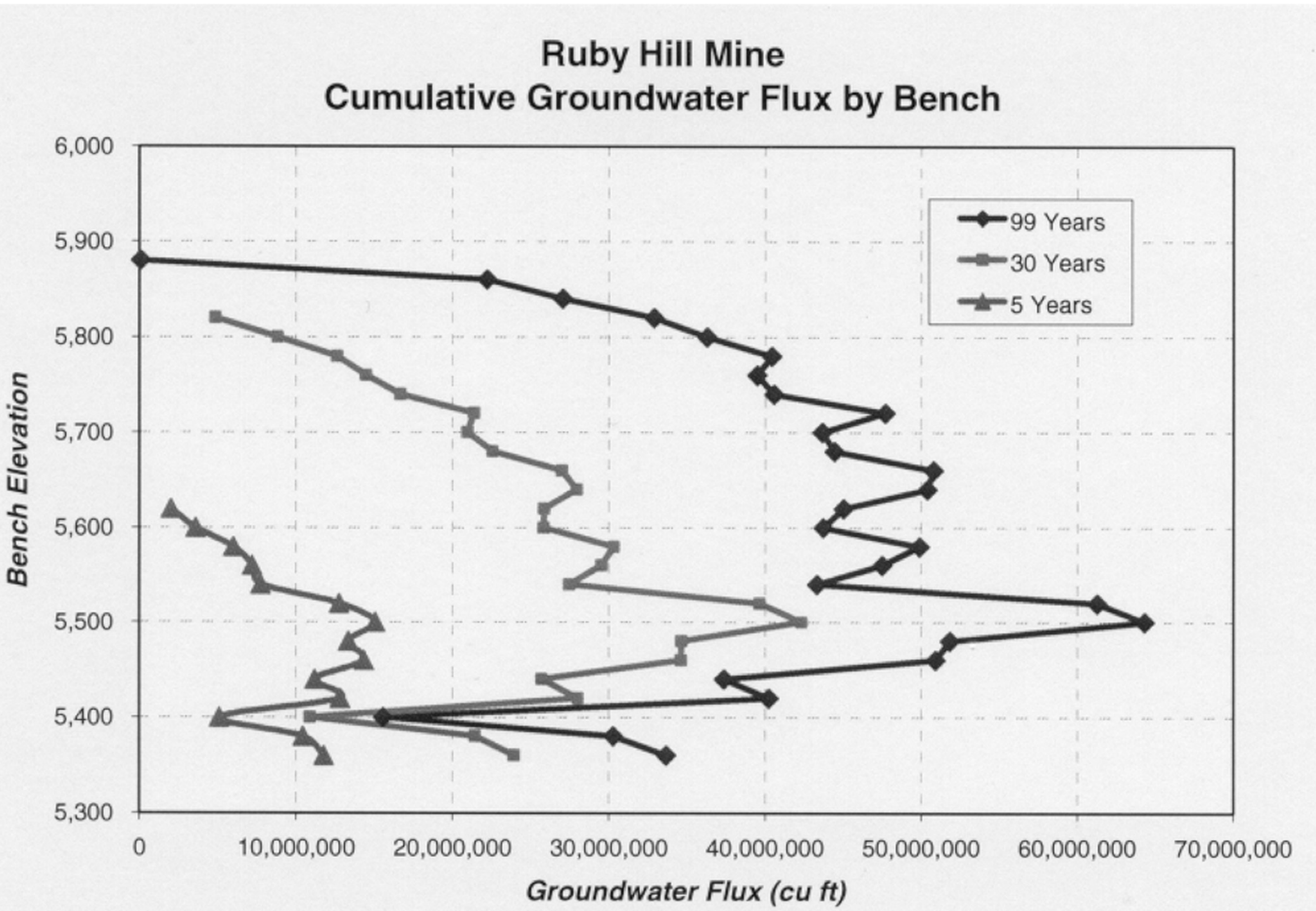
Pit Lake Water Balance

groundwater would account for 86 percent of the flow in year 5 and 72.1 percent in year 99. Schafer (2004) estimated the water quality in this groundwater by combining water from monitor well MW-1 (10 percent), water that was pumped during the 45-day pilot dewatering test at PW-1 (30 percent), and 30 percent each for water from monitor wells MW-2 and MW-6, which are located north of the proposed pit and within the estimated drawdown cone projected by the groundwater modeling (Jones 2004). Monitor well MW-1 has arsenic values up to 0.197 mg/L and is located just south of the final pit outline of the proposed East Archimedes Pit. PW-1 has two sample analyses with arsenic at 0.011 mg/L and at less than 0.01 mg/L. Monitor wells MW-2 and MW-6 have arsenic below 0.01 mg/L. Thus, the modeled influent groundwater has a composite arsenic concentration at or below 0.03 mg/L. This water contributes an estimated 72 to 86 percent of the inflow of water used in the geochemical model for the East Archimedes Pit lake. **Figure 3.4-10** shows the groundwater influx by bench elevation used for mass loading in the pit lake geochemical model.

Pit Lake Geochemical Model. The pit lake geochemical model for the proposed East Archimedes Pit was constructed in four steps by Schafer (2004). The first step was to simulate the expected pit lake water at years 5, 30, and 99 by creating synthetic mixtures using a batch mixing process that modeled the pit lake in the laboratory. The second step was to calibrate the USGS geochemical modeling code, PHREEQC (Parkhurst and Appelo 1999), to those batch mixing tests. The third step was to use the calibrated PHREEQC to model the pit lake chemistry for years 5, 30, and 99. The fourth step was to adjust the modeling for sediment/water interactions and lake mixing in year 99. During the calibration to the batch mixing tests, Schafer (2004) made adjustments to the PHREEQC thermodynamic database for the solubility of specific solids. The batch mixing tests and the calibration to those tests showed that the only metals above detection limits would be arsenic, barium, nickel, and zinc.

Schafer (2004) modeled three separate cases for the proposed East Archimedes Pit lake to show the possible range in values for constituents in the final pit lake. The three cases included: 1) no solid phases precipitated; 2) calibrated solubilities for solid phases allowed to precipitate; and 3) theoretical solubilities in the standard PHREEQC database for solid phases allowed to precipitate. These results are shown for chloride, arsenic, and barium in **Figures 3.4-11**, **3.4-12**, and **3.4-13**, respectively. Chloride concentrations were predicted to increase through time but would remain well below the Nevada drinking water quality standard of 250 mg/L. Assuming that chemical precipitation occurs as in the batch tests and removes some arsenic from the pit lake, arsenic was expected to increase slightly through time but to remain between 0.01 and 0.02 mg/L. Barium was expected to decrease slightly through time and to range from 0.02 to 0.09 mg/L. Nickel and zinc concentrations decreased due to precipitation and thus are not shown as graphs.

If no solids are assumed to precipitate in the model, which is the most conservative case and not expected to occur based on the batch mixing tests, arsenic would reach a level of 0.066 mg/L by year 99, while barium would be below 2.0 mg/L, nickel below 0.10 mg/L, and zinc below 5.0 mg/L. If the calibrated solubility case is used for prediction of the pit lake water quality, then arsenic would be at 0.018 mg/L by year 99. The theoretical solubility case has arsenic at 0.014 mg/L at year 99. The pH of the pit lake would be in the range of 8.4 to 8.7 standard units for all cases. The TDS would be in the range of 230 to 480 mg/L, and sulfate would be below 100 mg/L for all cases. Bicarbonate would be in the range of 100 to 240 mg/L for all cases. Thus, pit lake water is predicted to be within Nevada stock water and irrigation water standards for all constituents regardless of which modeling case is used.



Ruby Hill Mine Expansion

Figure 3.4-10

Groundwater Flux through Pit Benches

Source: Schafer 2004.

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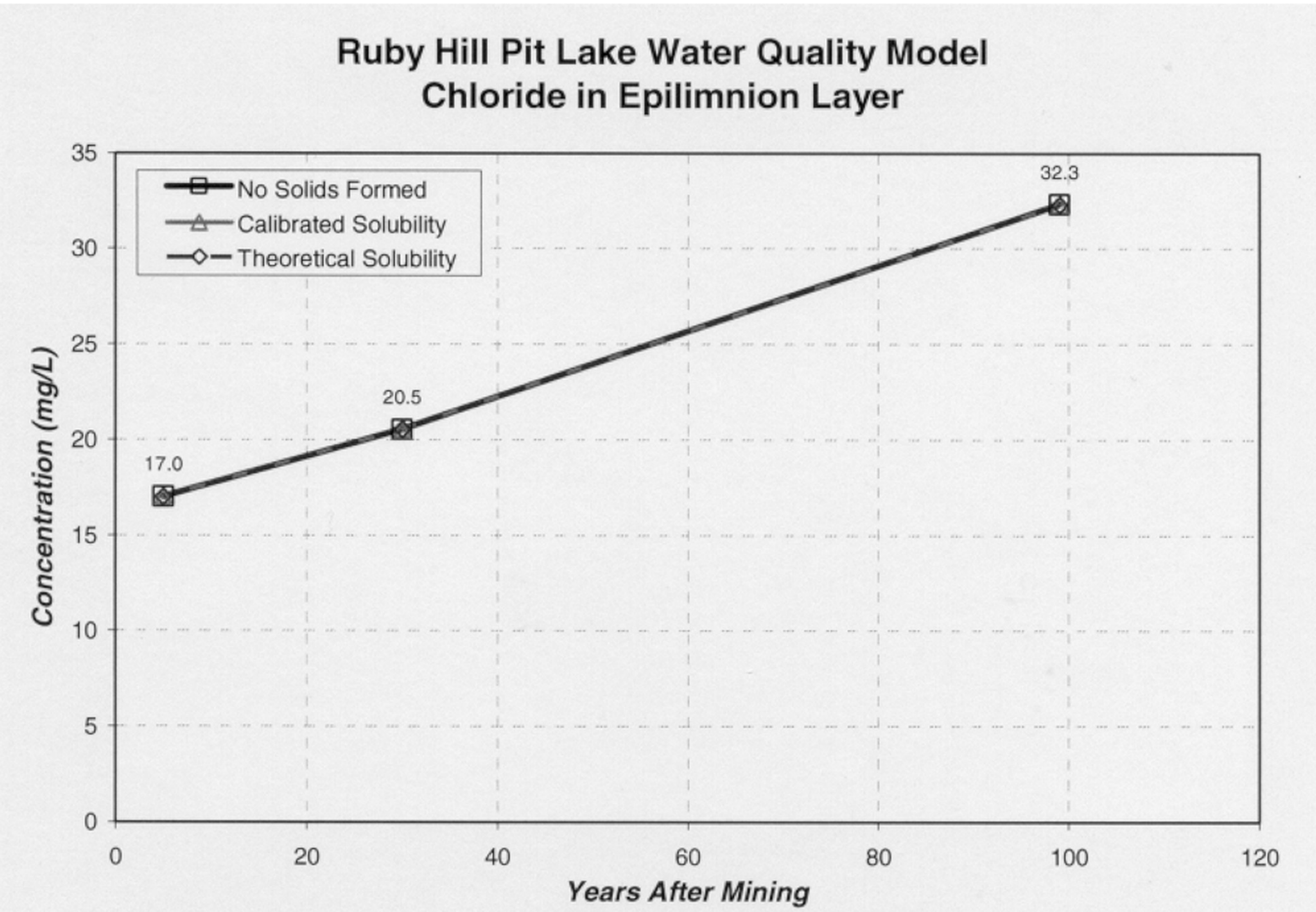

Ruby Hill Mine Expansion

Figure 3.4-11

Estimated Transient Changes in Chloride in the Ruby Hill Pit Lake

Source: Schafer 2004.

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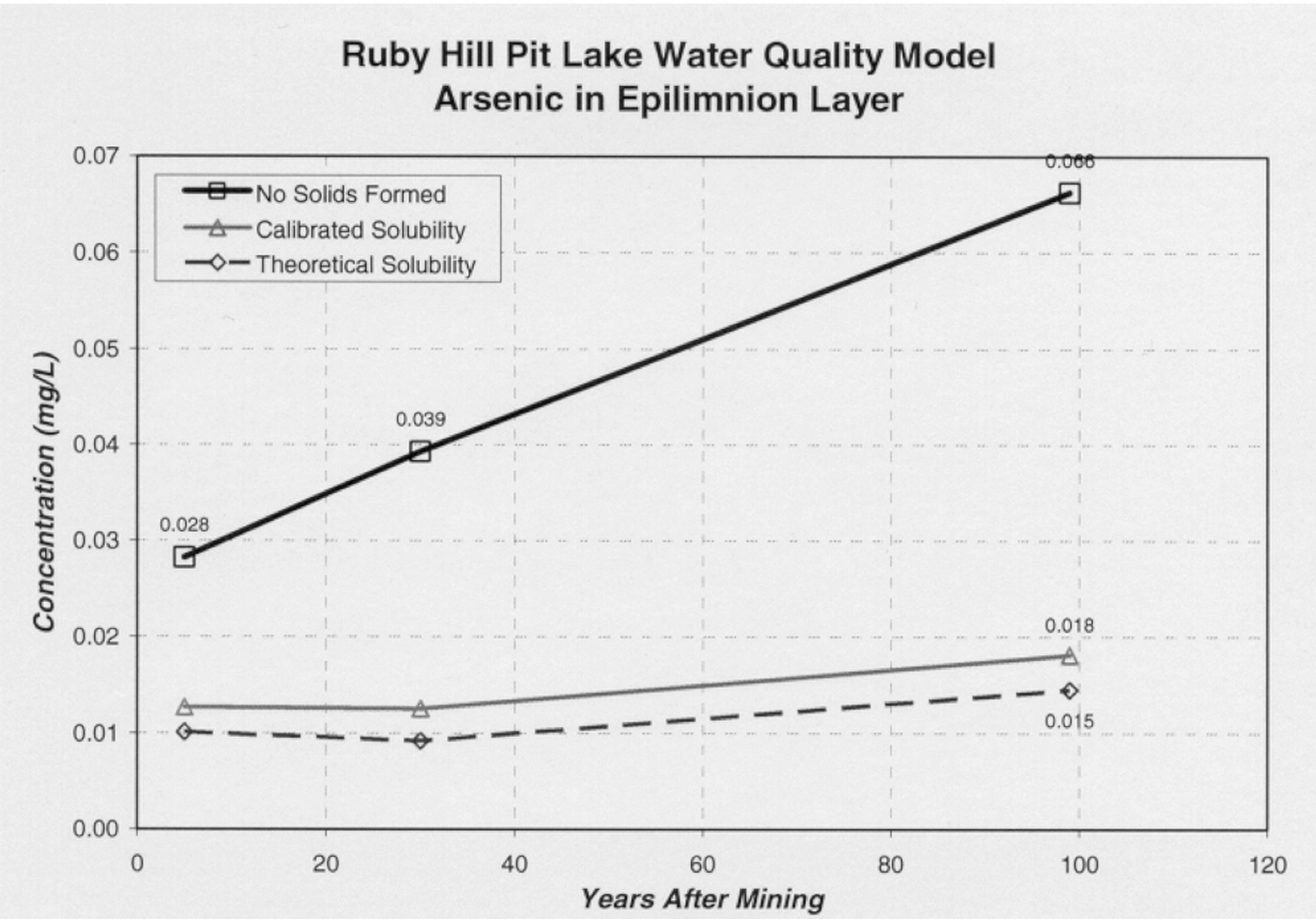

Source: Schafer 2004.

Ruby Hill Mine Expansion

Figure 3.4-12

Estimated Transient Changes in Arsenic in the Ruby Hill Pit Lake

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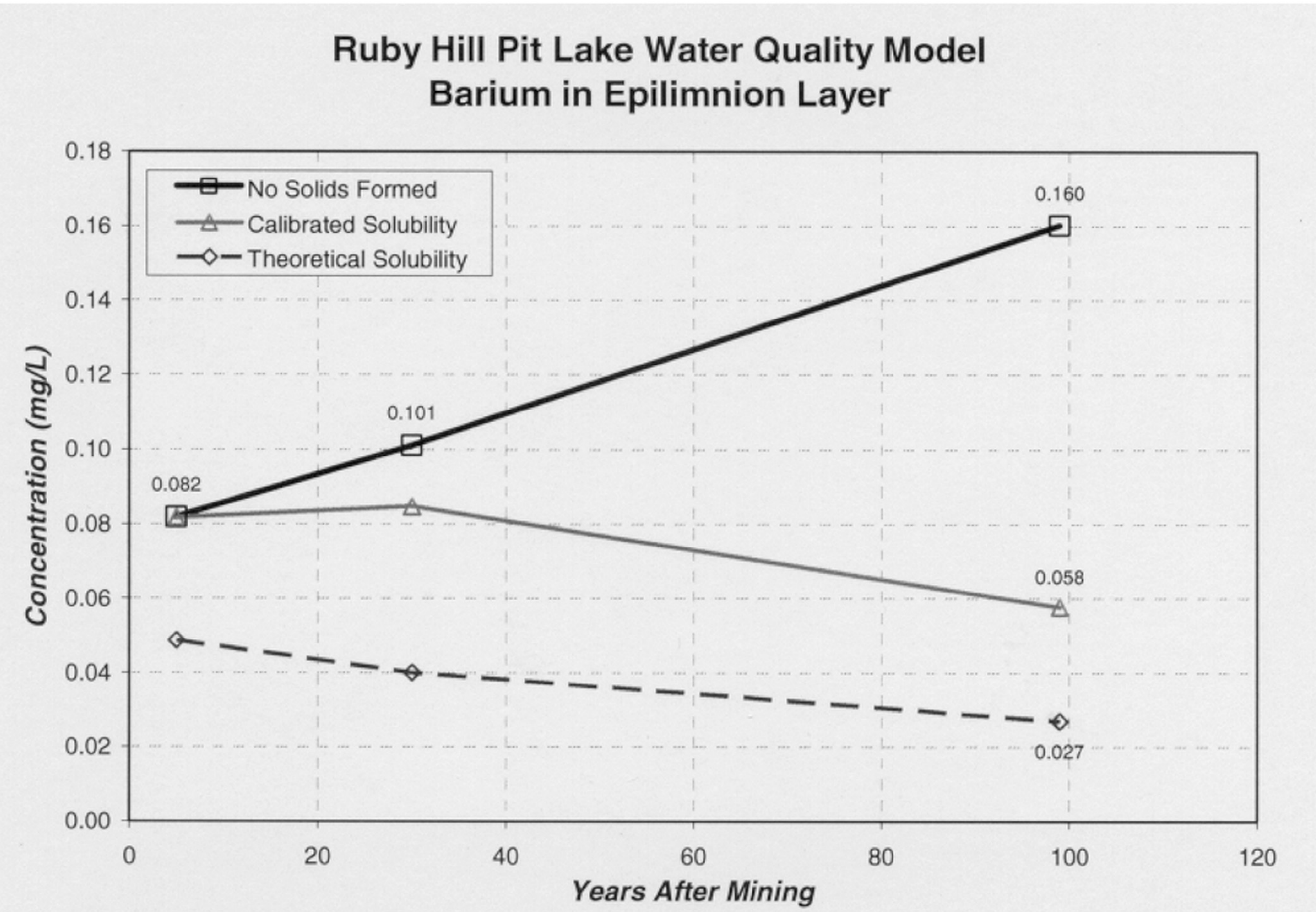


Ruby Hill Mine Expansion

Figure 3.4-13

Estimated Transient Changes in Barium in the Ruby Hill Pit Lake

Source: Schafer 2004.

The pit lake water quality modeling by Schafer (2004) was based on: 1) the geochemical tests conducted on the expected rock types in the pit highwall; 2) the groundwater modeling of Jones (2004) that estimated the flux of water through these different rock types over time for years 5, 30, and 99; and 3) the assumed proportions of water types that would constitute the mass loadings to the pit lake (Schafer 2004). These assumptions and the compositions used for the mass loading, which were based on experimental leaching studies and field data from monitor wells, are the main factors determining the estimated pit lake water quality over time. The modeling suggests that arsenic in the pit lake water should not exceed the Nevada stock water standard of 0.2 mg/L because both monitor wells and MWMP tests suggest that this is the general upper limit for arsenic in water at the Ruby Hill Mine site.

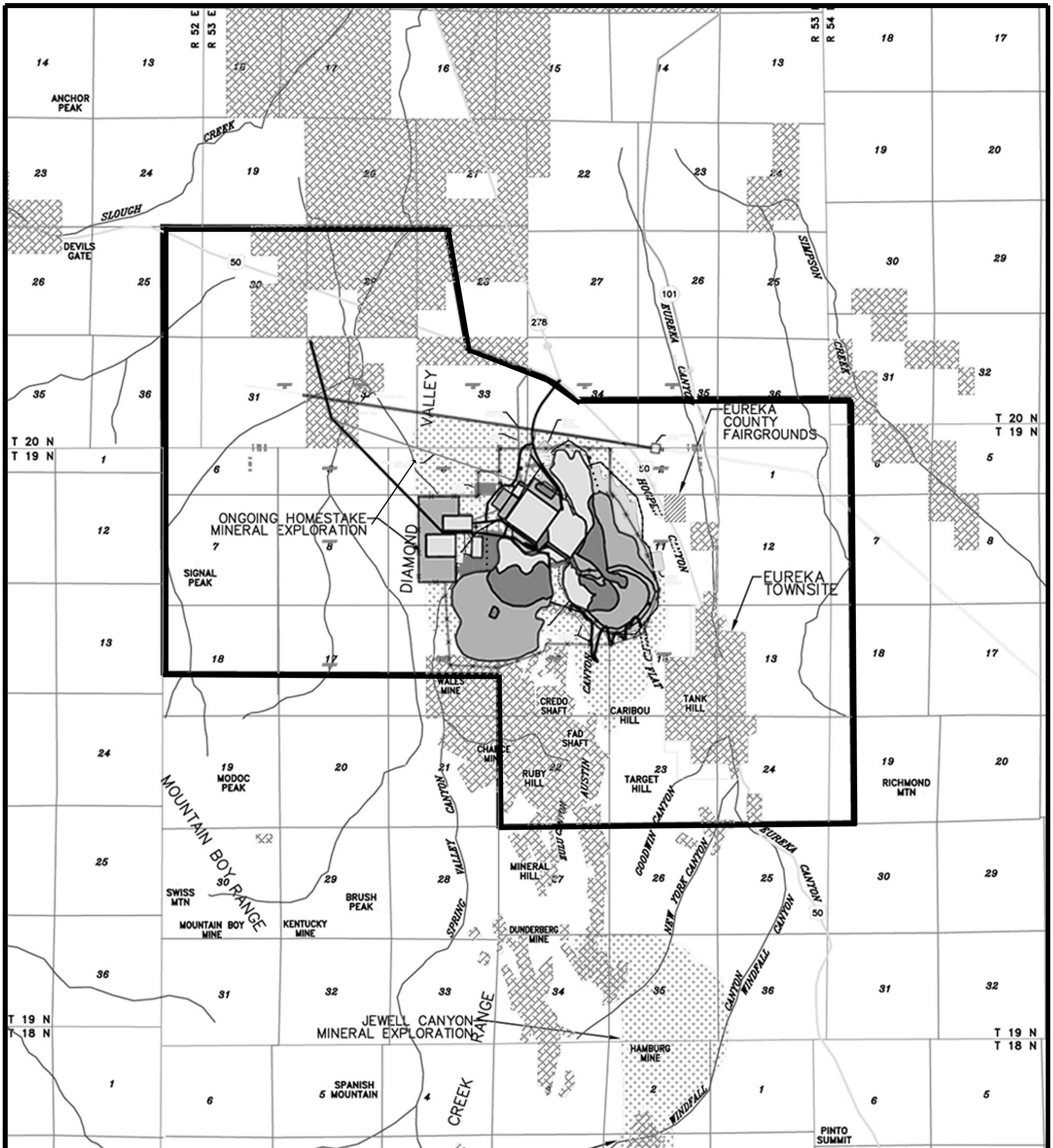
In evaluating the East Archimedes Pit lake water quality, the BLM assessed the need for an ecological risk assessment (ERA). This determination was based on the guidance in BLM Instruction Memorandum NV-2004-031, Ecological Risk Assessment Guidelines for Open Pit Mine Lakes in Nevada (BLM 2004c). These guidelines indicate “ERAs should normally be used for additional analysis when the predicted pit water chemistry identifies a potential problem with the future pit lake.” The BLM is directed to consider the applicable water quality standards determining the need for an ERA. In the case of the East Archimedes Pit lake, the pit lake water quality is not anticipated to exceed stock water or irrigation standards. Therefore, the BLM determined that an ERA was not required as part of the NEPA analysis of the proposed project.

3.4.2.2 No Action Alternative

Under the No Action Alternative, the existing mine facilities would not be expanded and no groundwater would be pumped from or returned to the shallow alluvial aquifer. Currently permitted, ongoing ore processing would continue to completion. Potential environmental impacts associated with the ongoing Ruby Hill Mine operations were addressed in the Ruby Hill Project Final EIS (BLM 1997a).

3.4.3 Cumulative Impacts

The cumulative impact area for water quality and quantity is shown in **Figure 3.4-14**. Interrelated projects are identified in **Table 2-9**. Mine-related drawdown of the groundwater table in the shallow carbonate bedrock and the alluvial aquifer would be 10 feet at a maximum distance of approximately 2 miles from the proposed East Archimedes Pit. In the southern part of Diamond Valley, this drawdown would be in addition to the continuing decline of the groundwater table by approximately 2 feet per year due to irrigation pumping. Water quality in groundwater discharged to southern Diamond Valley should be within Nevada drinking, irrigation, and stock water standards. Pit dewatering is not expected to affect perennial springs or seeps, because these features would be located upgradient of the pit expansion area and would be perched above the groundwater table in carbonate bedrock. Potential underground mining at the Ruby Hill Mine has been identified as a RFFA. If future underground mining should occur, continued dewatering likely would be required to facilitate mining operations. Dewatering volumes, associated reinjection and/or infiltration volumes, and potential environmental impacts would be determined during baseline studies and groundwater modeling that would be conducted prior to the environmental permitting process.



Legend

- Past disturbance
- Present disturbance
- Existing facilities
- Proposed facilities
- Existing and proposed facilities overlap
- Cumulative assessment boundary

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Ruby Hill Mine Expansion

Figure 3.4-14

Cumulative Impact Area for Water Quality and Quantity

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3.4.4 Mitigation or Monitoring

No adverse impacts to water quality are anticipated as a result of mine operations or due to water disposed of through either injection or infiltration basins. The pit lake should be within Nevada stock water standards for all constituents at year 99 after cessation of mining. Therefore, no monitoring or mitigation for water quality has been identified beyond the monitoring requirements in compliance with Homestake's water pollution control permit.

Issue: Water supply wells near Eureka (Spring Street, Atlas, Elementary School, City Park, and Melka wells) could experience up to 20 feet of drawdown.

Mitigation Measure W1: ***Homestake would monitor water levels in several existing wells within the town of Eureka (Atlas Park well, Elementary School well, City Park well, Vet Clinic well, and at least two of the Ambulance Bay/Sheriff's Office wells), although it is noted that the Elementary School and City Park wells are used for irrigation and would only be monitored during the non-use season. Additionally, Homestake has committed to install and monitor four additional monitoring wells, one near the Eureka County Fairgrounds, another near the intersection of Highway 50 and SR 278, and two others near the southern end of Eureka (see Mitigation Measures W2 and W3). Water level information from all of these monitoring wells would be shared with Eureka County as it is received.***

Effectiveness: This measure would provide for identification of potential mine-related groundwater drawdown in Eureka County water supply wells and a process for developing appropriate mitigation to minimize potential impacts to water supply.

Issue: Potential subsidence-related impacts on U.S. Highway 50 northeast of the mine site, and other public facilities within and adjacent to the highway ROW, as a result of mine-related groundwater drawdown.

Mitigation Measure W2: Homestake would install several ground surface monitoring points northeast of the proposed East Archimedes Pit to monitor for potential ground surface subsidence. These monitoring points would be both within and adjacent to the zone of saturated alluvium extending northeast of the mine site, and would be monitored on a quarterly basis. In the event that mine-related subsidence should be observed within this area, Homestake, in coordination with the applicable agencies, would develop an appropriate plan of action to ensure that the integrity of the highway and other public facilities would be maintained.

Effectiveness: This measure would provide for early identification of potential mine-related subsidence and a process for developing appropriate mitigation to minimize potential subsidence-related impacts to public facilities.

Issue: Potential subsidence beneath the town of Eureka associated with groundwater drawdown from dewatering of the East Archimedes Pit.

Mitigation Measure W3: Homestake would install two new groundwater wells in the southern end of Eureka to monitor groundwater drawdown associated with pit dewatering. In the event significant drawdown in near-surface groundwater levels attributable to mine dewatering were to occur,

Homestake would coordinate with Eureka County to determine potential subsidence-related impacts and to mitigate the impacts.

Effectiveness: This measure would identify any trends in near-surface groundwater levels that may be attributable to Ruby Hill dewatering operations and the potential for subsidence beneath the Eureka townsite.

3.4.5 Residual Adverse Impacts

No residual adverse impacts are expected beyond the localized groundwater drawdown associated with removal of groundwater from the carbonate bedrock during dewatering operations and groundwater mounding associated with reinjection or infiltration of excess dewatering water into the shallow alluvial aquifer of southern Diamond Valley.

3.5 Soils

The soils study area for direct and indirect impacts is the existing Ruby Hill Mine study area, which includes the proposed mine expansion area. The cumulative impact area encompasses the 16,502-acre Ruby Hill grazing allotment, which includes 13,945 acres of BLM-administered land and 2,557 acres of private land.

3.5.1 Affected Environment

Physiographic features that occur in the project area include alluvial fans, terraces, and an alluvial basin. Alluvial fans and terraces are located at higher elevations within the project area and are positioned between foothills to the south and Diamond Valley to the west, north, and east. These fans and terraces typically include a mixture of coarse fragments (e.g., gravel and cobble) and several textures of soils (e.g., loam, sandy loam, silt loam). Soils associated with these landforms are gently sloping to steep, shallow to moderately deep, and well drained. A portion of the project area is located in the extreme southern portion of Diamond Valley, which is a large alluvial basin. Alluvial basins are characterized by nearly level to moderately sloping, well-drained soils that are moderately deep. Soil textures that predominantly occur in alluvial basins include silt loam, silty clay loam, and sandy loam.

Twelve soils occur in the project vicinity, of which six soils occur in the proposed disturbance area. These soils include the Umil association; Rubyhill fine sandy loam, 2 to 8 percent slopes; Bartine-Overland association; Shipley complex; Kobeh gravelly fine sandy loam, 2 to 4 percent slopes; and Shipley silt loam, 0 to 2 percent slopes (Natural Resources Conservation Service [NRCS] et al. 1980) (**Figure 3.5-1**). A summary of the physical characteristics and reclamation suitabilities of these soils is provided in **Table 3.5-1**.

The Umil association is the dominant soil that occurs in the proposed disturbance area. Major soils in this association include Umil loam, 2 to 4 percent slopes (60 percent) and Umil cobbly loam, 15 to 50 percent slopes (30 percent). Inclusions of Holtle soils (10 percent) occasionally occur with this association. Umil soils are located on gently sloping, old alluvial fans that are dissected deeply by intermittent drainages and have moderately steep to steep side slopes. These soils consist of well-drained soils that formed in alluvium mainly from limestone, dolomite, and mixed igneous material. The dominant texture of the surface soil and subsoil is loam, which is mixed with approximately 10 to 50 percent gravel. The subsoil also is moderately to strongly alkaline. Soil that can be salvaged for reclamation activities includes 11 inches of soil (4 inches of surface soil and 7 inches of subsoil). A white, indurated, silica-lime hardpan is located approximately 11 inches below the soil surface with a thickness of approximately 23 inches. Barren soil is moderately to rapidly eroded by water and moderately to severely eroded by wind.

The Rubyhill fine sandy loam, 2 to 8 percent slopes, also is a major soil present within the proposed disturbance area and accounts for 80 percent of the soil in this map unit. Soils that may be inclusions within this map unit include other Rubyhill and Ratto soils (20 percent). This soil occurs on old, dissected alluvial fans with gentle to moderate slopes. Rubyhill soils are considered well-drained soils that formed in alluvium derived from limestone and quartzite. The dominant texture of the surface soil is fine sandy loam, and the subsoil is loam or light clay loam. The surface soil is mixed with approximately 5 to 30 percent gravel. Soil that can be salvaged for reclamation activities includes 21 inches of soil (4 inches of surface soil and 17 inches of subsoil). The subsoil consists of 20 to 35 percent gravel and is underlain by a white, indurated,

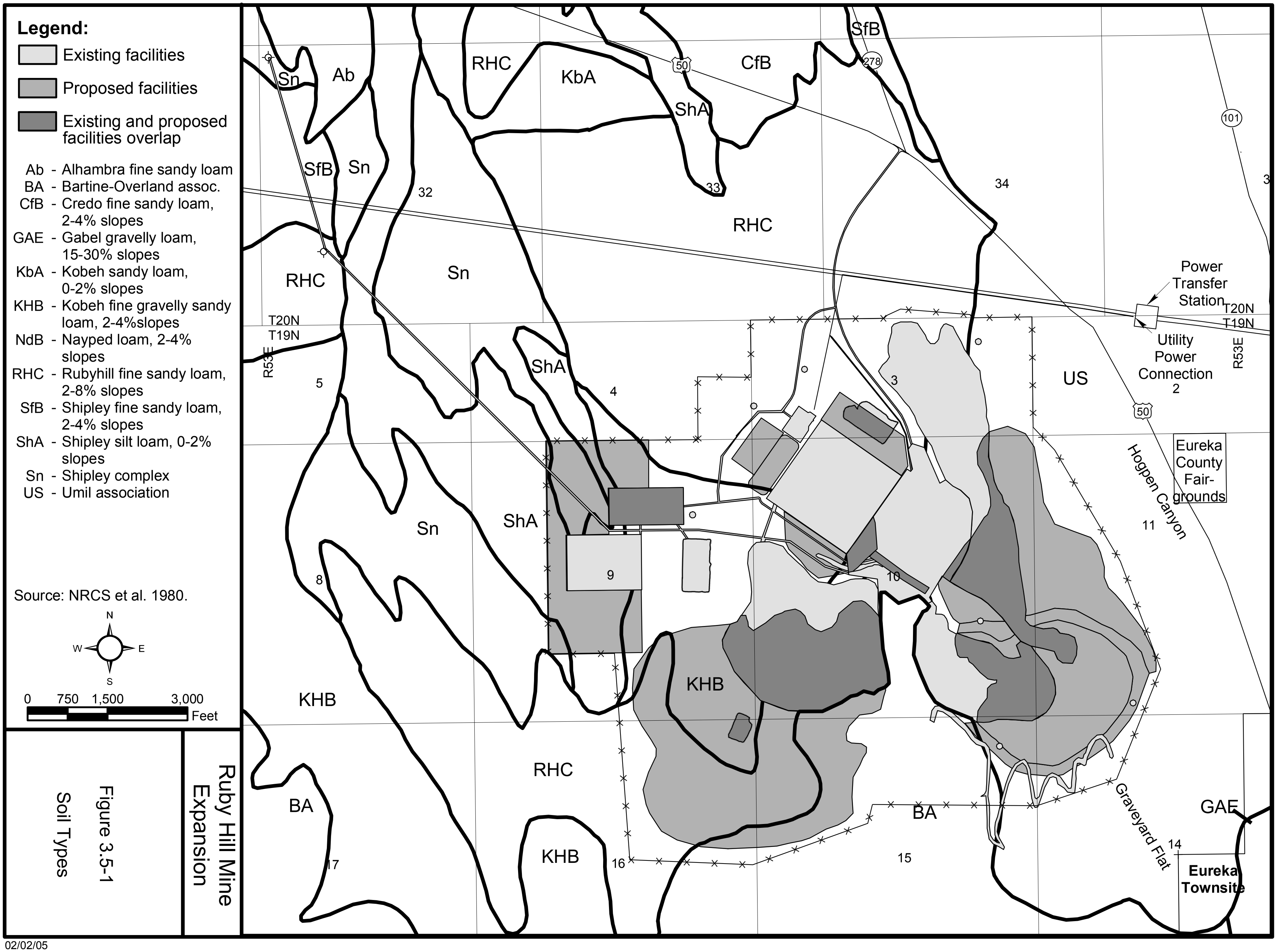


Figure 3.5-1

Soil Types

Table 3.5-1
Characteristics of Soils in the Project Area

Map Unit Symbol	Map Unit Name	Dominant Soil(s)	Inclusions Within Map Unit	Terrain and Slopes	Parent Material Type	RSD[1] (inches)	Dominant Texture of Suitable Soil and Depth	Erosion Hazard of Barren Surface (Water/Wind)	Limiting Factors
US	Umil association	Umil loam, 2 to 4 percent slopes (60 percent) and Umil cobbly loam, 15 to 50 percent slopes (30 percent)	Holtle soils (10 percent)	Gently sloping old alluvial fans deeply dissected by intermittent drainages; slopes range from 2 to 50 percent	Alluvium derived from limestone, dolomite, and mixed igneous material	11	Loam (11 inches)	Moderate to rapid/moderate to severe	Subsoil consists of 10 to 50 percent gravel and is moderately to strongly alkaline; indurated duripan below 11 inches
RHC	Rubyhill fine sandy loam, 2 to 8 percent slopes	Rubyhill fine sandy loam, 2 to 8 percent slopes (80 percent)	Other Rubyhill soils and Ratto soils (20 percent)	Gently sloping to moderately sloping soil on old, dissected alluvial fans	Alluvium derived from limestone and quartzite	21	Fine sandy loam (4 inches) and loam or light clay loam (17 inches)	Slow/slight	Subsoil consists of 20 to 35 percent gravel; strongly cemented duripan below 21 inches
BA	Bartine-Overland association	Bartine gravelly loam, 15 to 50 percent slopes (40 percent) and Overland very gravelly loam, 15 to 50 percent slopes (40 percent)	Holtle and Umil soils (10 percent) and rock outcrop (10 percent)	North- and south-facing mountainsides; slopes range from 15 to 50 percent	Residuum from limestone that is mixed with shale, conglomerate, and quartzite	14	Gravelly loam (14 inches)	Rapid/moderate to severe	Subsoil consists of 50 to 70 percent gravel and cobble; limestone bedrock below 31 inches
Sn	Shipley complex	Shipley silt loam, sandy subsoil variant (60 percent) and Shipley silt loam, 0 to 2 percent slopes (30 percent)	Alhambra and Kobeh soils (10 percent)	Alluvial fans with slopes between 0 to 2 percent	Alluvial and lacustrial material	0	NA	Slow/slight	Surface soils are highly alkaline; very gravelly loamy fine sand below 32 inches
KHB	Kobeh gravelly fine sandy loam, 2 to 4 percent slopes	Kobeh gravelly fine sandy loam, 2 to 4 percent slopes (85 percent)	Shipley, Rubyhill, Nayped, and other Kobeh soils (15 percent)	Alluvial fans with slopes between 2 to 4 percent	Alluvial material derived from limestone and sandstone	17	Gravelly, fine sandy loam (17 inches)	Slow/slight	Subsoil consists of 30 to 60 percent gravel and is strongly alkaline

Table 3.5-1 (Continued)

Map Unit Symbol	Map Unit Name	Dominant Soil(s)	Inclusions Within Map Unit	Terrain and Slopes	Parent Material Type	RSD[1] (inches)	Dominant Texture of Suitable Soil and Depth	Erosion Hazard of Barren Surface (Water/Wind)	Limiting Factors
ShA	Shipley silt loam, 0 to 2 percent slopes	Shipley silt loam, 0 to 2 percent slopes (85 percent)	Alhambra and Kobeh soils (15 percent)	Irregularly shaped areas within small and medium floodplains; slopes range from 0 to 2 percent	Alluvial and lacustrial material	14	Silt loam (14 inches)	Slow/slight	Subsoil is strongly alkaline

[1]RSD: Recommended suitable soil salvage depth.

NA = Not applicable.

Source: NRCS et al. 1980.

silica-lime duripan that is located approximately 21 inches below the soil surface. This duripan is approximately 29 inches thick and typically occurs 21 to 50 inches from the soil surface. Barren soil is slowly eroded by water and slightly eroded by wind.

The Bartine-Overland association primarily consists of Bartine gravelly loam, 15 to 50 percent slopes (40 percent) and Overland very gravelly loam, 15 to 50 percent slopes (40 percent). Soils that may be included within this map unit include Holtle and Umil soils (10 percent) and rock outcrop (10 percent). These soils are located on north- and south-facing mountainsides and are well-drained. These soils formed from residuum that is mixed with shale, conglomerate, and quartzite. The dominant texture of the surface soil and subsoil is gravelly loam. These soil textures are mixed with 20 percent gravel and 10 percent cobble in the upper 5 inches and 50 to 70 percent coarse fragments in the subsoil. The subsoil is underlain by a limestone bedrock layer that is located approximately 31 inches below the soil surface. Soil that can be salvaged for reclamation activities includes the upper 14 inches of soil (5 inches of surface soil and 9 inches of subsoil). Barren soil is rapidly eroded by water and moderately to severely eroded by wind.

The Shipley complex largely consists of Shipley silt loam, sandy subsoil variant, 0 to 2 percent slopes (60 percent) and Shipley silt loam, 0 to 2 percent slopes (30 percent). Soils that may be inclusions within this map unit include Alhambra and Kobeh soils (10 percent). Shipley complex soils are deep, well-drained soils that occur on gentle slopes of alluvial fans and lake terraces. The dominant texture of the surface soil is silt loam and the subsoil consists of silt loam and very gravelly loamy fine sand. This soil should not be salvaged since it is strongly alkaline and contains a high percentage of coarse fragments. Barren soil is slowly eroded by water and slightly eroded by wind.

The Kobeh gravelly fine sandy loam, 2 to 4 percent slopes, is located on medium and large irregularly shaped alluvial fans and accounts for 85 percent of this map unit. Several soils, including Shipley, Rubyhill, Nayped, and other Kobeh soils, comprise 15 percent of this map unit. Kobeh soils are considered excessively drained soils that formed in alluvium primarily derived from limestone and sandstone. The dominant texture of the surface soil is gravelly, fine sandy loam, and the subsoil is gravelly, fine sandy loam, and gravelly, light sandy loam. The surface soil is mixed with approximately 10 percent gravel. Soil that can be salvaged for reclamation activities includes 17 inches of soil (7 inches of surface soil and 10 inches of subsoil). The portion of the subsoil that is not salvageable contains 30 to 60 percent gravel and is strongly alkaline. Barren soil is slowly eroded by water and slightly eroded by wind.

The Shipley silt loam, 0 to 2 percent slopes, is located on irregularly shaped areas within small and medium floodplains and accounts for 85 percent of this map unit. Several soils, including Alhambra and Kobeh soils, comprise 15 percent of this map unit. Shipley soils are well-drained soils that formed in mixed alluvium and lacustrine material and are located on alluvial fans and lake terraces. The dominant texture of the surface soil is silt loam and the subsoil is very fine sandy loam. According to the NRCS, these soils are classified as prime farmland soils, if irrigated (Harraman 2005). However, areas within the project area that include these soils do not meet the criteria for prime farmland since they support desert scrub vegetation (i.e., are not irrigated). Soil that can be salvaged for reclamation activities includes 14 inches of soil (3 inches of surface soil and 11 inches of subsoil). The portion of the subsoil that is not salvageable is strongly alkaline. Barren soil is slowly eroded by water and slightly eroded by wind.

In addition to these soils, Shipley fine sandy loam, 2 to 4 percent slopes, which occurs along the northern portion of the existing Collingwood well water supply pipeline, is classified by the NRCS as prime farmland, if irrigated (Harraman 2005). Soils that occur in this location meet the criteria for prime farmland soils since they currently are being used as irrigated cropland. However, these prime farmland soils occur outside of the proposed disturbance area. As a result, they would not be affected and are not analyzed further in this document.

3.5.2 Environmental Consequences

Soil reclamation and erosion potential are the primary issues considered in the evaluation of potential impacts to soils. Growth media within the project area were evaluated for suitability for reclamation use. Threshold values for soils considered poor for reclamation use were based on information provided in the BLM *Solid Minerals Reclamation Handbook H-3042-1* (BLM 1992). The soil parameters and factors to evaluate the suitability of soils for reclamation include:

- Sodium adsorption ratio - 8 to 16 (excess sodium);
- Electrical conductivity - 7 to 15 (excess salt);
- pH - 4.5 to 5 (too acidic) and 8.5 to 9 (too alkaline);
- Soil texture – sandy clay, loamy sand, and silty clay; clay greater than 60 percent is considered unsuitable;
- Coarse fragments – 20 to 40 percent, with greater than 40 percent considered unsuitable.

Soils that exhibited a poor rating were considered unsuitable for salvage and reclamation. Poorly rated materials have such severe problems that revegetation and stabilization would be very difficult and costly. In the latter case, soil reapplication with better suited growth media would be necessary to establish and maintain vegetative growth.

3.5.2.1 Proposed Action

Potential impacts to soil resources include accelerated soil erosion rates and loss of productivity as a result of mining and reclamation activities. Potential soil erosion rates and off site sedimentation impacts associated with the Proposed Action would be reduced or avoided with the implementation of interim and concurrent reclamation activities as described in Section 2.3.15, Reclamation, and installation of erosion control measures identified in Section 2.3.14, Applicant-committed Environmental Protection Measures.

Accelerated soil erosion rates may occur during mine operation due to removal and trampling of vegetation, surface soil disturbance, soil compaction, and salvaging and reclamation activities. Plant cover provided by vegetation in the project area would be removed and trampled during mine operation, thereby increasing the potential for accelerated erosion rates. Surface disturbance and soil compaction resulting from mine equipment use would reduce the water infiltration rate of soils and potentially increase runoff.

Reclamation activities would include grading of slopes, re-application of growth media, and revegetation for the majority of project components. Growth media would be applied to the expanded waste rock disposal areas, heap leach pad expansion areas, and newly proposed storm water event pond. Growth media present along access and haul roads, diversion channels, and overflow pond areas would be salvaged, as necessary, and used to construct safety berms instead of being salvaged, transported, and stored at the growth media stockpiles. Growth media required for the majority of reclamation activities would be salvaged from the pit expansion area.

The Proposed Action would disturb 744 acres of soils, of which growth media from 100 acres (pit expansion area) would be salvaged for reclamation activities. Alluvium depths in the pit expansion area range from 400 to 650 feet deep (WMC 2004). Approximately 1 million cubic yards of growth media would be available for salvage and stockpiling from the pit expansion area for future reclamation activities. Growth media would be used to reclaim 680 asbuilt acres (644 plan view acres) of disturbed land at a minimum depth of 6 inches.

After growth media salvaging has been completed, the growth media stockpile would be seeded with an interim seed mix, and a ditch may be constructed along the periphery of the stockpile to reduce soil erosion. The slopes of the growth media stockpile would be approximately 3H:1V.

Stockpiled growth media would have higher than normal wind and water erosion rates until successful interim vegetation has been established. Successful revegetation of the stockpiles is anticipated to occur approximately 3 years after reseeding. At that time, plant cover would be sufficient to substantially decrease soil erosion. The ditches along the periphery of the growth media stockpile would collect eroded soil from the stockpile and eliminate the potential for off site transportation of soil by water and sedimentation effects to intermittent drainages.

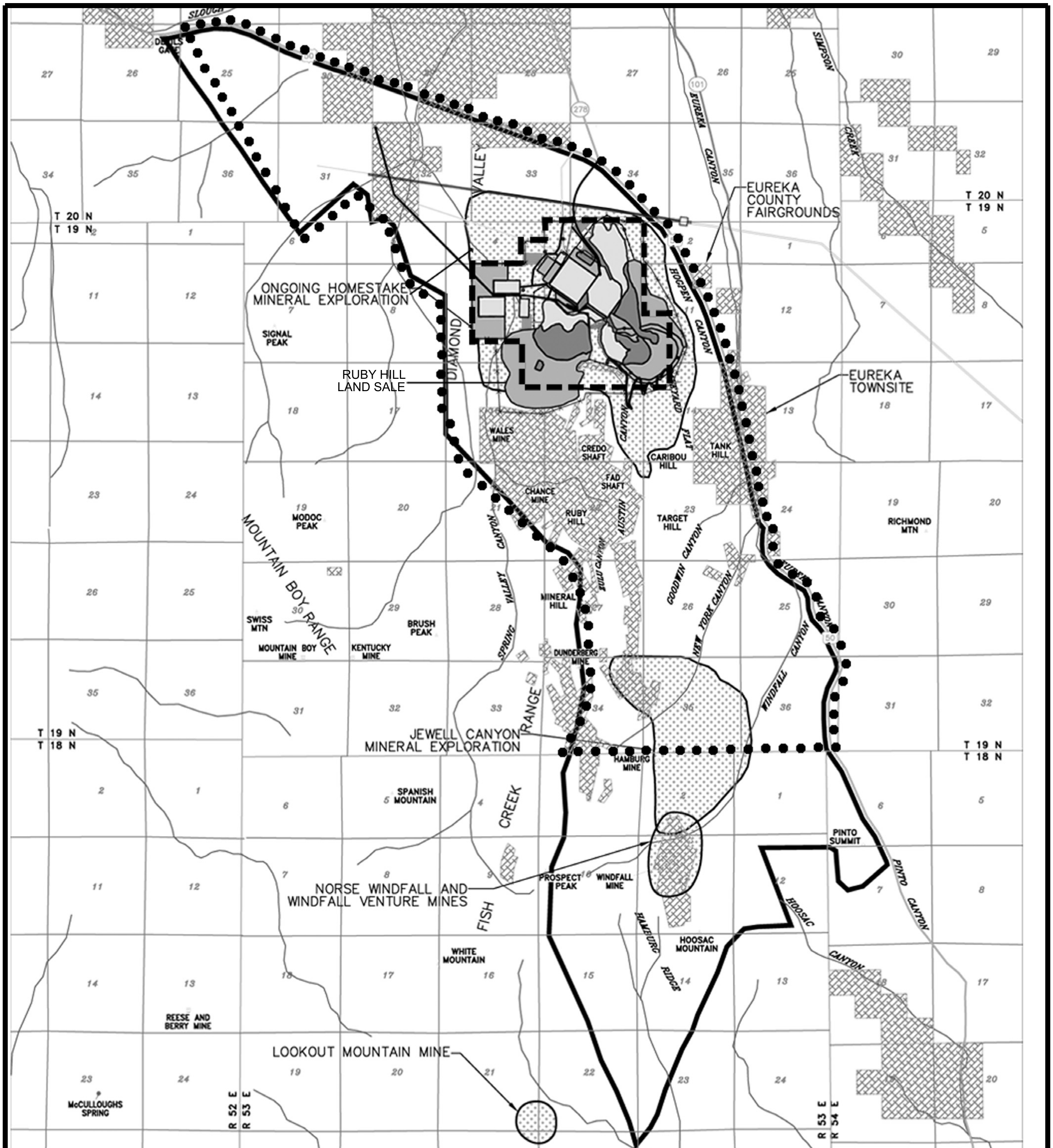
Reclamation activities would take place along the periphery of the waste rock disposal expansion areas concurrently with mine operation. The waste rock slopes would be graded to 3H:1V slopes before the reapplication of growth media. Growth media would be susceptible to wind and water erosion until revegetation efforts have provided adequate plant cover to reduce erosion potential. Sedimentation control structures would collect eroded soils from the waste rock disposal expansion areas and eliminate the potential for off site transport of soil by water and sedimentation effects to intermittent drainages.

3.5.2.2 No Action Alternative

Under the No Action Alternative, the proposed mine expansion would not be developed, and related impacts to soils would not occur. There would be no new surface disturbance or related soils impacts associated with ongoing mineral processing and reclamation under this alternative. Soils impacts associated with existing disturbance areas at the mine site would continue to be reduced as a result of soil stabilization associated with ongoing implementation of the reclamation plan.

3.5.3 Cumulative Impacts

The cumulative impact area for soils is shown in **Figure 3.5-2** and encompasses an area of 16,502 acres. Interrelated projects are identified in **Table 2-9**. Past and present interrelated projects within the cumulative impact area have resulted in 3,668 acres of soil disturbance, or disturbance to approximately 22 percent of



Legend

- Past disturbance
- Present disturbance
- Existing facilities
- Proposed facilities
- Existing and proposed facilities overlap
- Cumulative assessment boundary
- BLM fire management program area (past disturbance)
- Ruby Hill land sale (past disturbance) (A future land sale also has been identified as a RFFA. The affected area would be outside of, but adjacent to, the Ruby Hill land sale boundary.)

N W E S

0 1 2 Miles

Ruby Hill Mine Expansion

Figure 3.5-2

Cumulative Impact Area for Soils, Vegetation, Invasive and Non-native Species, and Range Resources

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the soils in the cumulative impact area. The two identified RFFAs in the cumulative impact area would not result in additional soil disturbance and, therefore, would not have a cumulative interaction with the Proposed Action. The Proposed Action incrementally would increase soil disturbance and related impacts in the cumulative impact area by an additional approximately 744 acres, resulting in an overall disturbance to soils on 4,412 acres (27 percent) in the cumulative impact area. It is assumed that portions of past disturbances have been reclaimed, and ongoing reclamation at the existing Ruby Hill Mine would continue to reduce the impacts to soils in that area. The incremental addition of soils impacts as a result of the Proposed Action would be temporary in nature for the majority of the expansion area, pending completion of successful reclamation.

3.5.4 Mitigation and Monitoring

No mitigation or monitoring measures have been identified for soils as reclamation activities and committed environmental protection measures included as part of the Proposed Action substantially would reduce potential impacts to soil resources.

3.5.5 Residual Adverse Impacts

Residual impacts to soils would include the long-term loss of soil productivity from approximately 100 acres of soil associated with the mine pit expansion area, which would not be reclaimed.

3.6 Vegetation Resources

The vegetation resources study area for direct and indirect impacts is the existing Ruby Hill Mine study area, which includes the proposed mine expansion area. The cumulative impact area encompasses the 16,502-acre Ruby Hill grazing allotment, which includes 13,945 acres of BLM-administered land and 2,557 acres of private land.

3.6.1 Affected Environment

3.6.1.1 General Vegetation

The project area is located in the Central Great Basin floristic region of the intermountain physiographic region (Cronquist et al. 1972). This floristic region is characterized by mountain ranges trending north and south with large, extensive valleys located between the mountain ranges. Vegetation types that occur along the mountain ranges include coniferous forest and piñon-juniper woodland; vegetation types that occur at lower elevations include juniper woodland, sagebrush scrub, saltbush scrub, and grassland. The project area is located in a transitional zone between piñon-juniper woodland, juniper woodland, and sagebrush scrub. Site-specific vegetation studies were conducted in the project vicinity during 1994 and 1995 (WESTEC 1994, 1995b). These studies included the delineation of plant communities based on aerial photograph interpretation and on site vegetation surveys. Vegetation sampling was completed at representative sites within these plant communities to determine plant composition and to estimate foliar cover, forage production, and other vegetative parameters.

Five plant communities are located in the project area, including juniper woodland/black sagebrush, Wyoming big sagebrush/grassland, juniper woodland/Wyoming big sagebrush, Basin big sagebrush/Great Basin wildrye, and winterfat/grassland (**Figure 3.6-1**). The juniper woodland/black sagebrush, Wyoming big sagebrush/grassland, and juniper woodland/Wyoming big sagebrush communities are the dominant plant communities that occur in the project area. These communities are interspersed within the project area, and the distribution of these communities is directly related to subtle differences in landscape position, soil texture and moisture, and aspect.

The juniper woodland/black sagebrush community is the most prevalent community in the project area. This community occurs on gently sloping, old alluvial fans that are dissected by intermittent drainages and have gentle to moderately steep side slopes. This community is characterized by a dominant overstory consisting of Utah juniper, singleleaf piñon, and bitterbrush and a subdominant understory consisting of black sagebrush, king sandwort, Hood's phlox, desert elkweed, squirreltail, Sandberg's bluegrass, and Indian ricegrass. The average foliar cover for this community is approximately 24 percent (range 18 to 35 percent), and the estimated annual forage production is 671 pounds per acre.

The juniper woodland/Wyoming big sagebrush community also occurs on gently sloping, old, alluvial fans that are dissected by intermittent drainages and have gentle to moderately steep side slopes. This community includes a dominant overstory consisting of Utah juniper and Wyoming big sagebrush and a subdominant understory consisting of Hood's phlox, Watson's cryptantha, squirreltail, Sandberg's bluegrass, and Great Basin wildrye. The average foliar cover for this community is approximately 20 percent (range: 8 to 32 percent), and the estimated annual forage production is 367 pounds per acre.

Ruby Hill Mine Expansion

Figure 3.6-1

Vegetation Communities

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The Wyoming big sagebrush/grassland community also occurs on gently sloping, old alluvial fans that are dissected by intermittent drainages and have gentle to moderately steep side slopes. This community is characterized by a dominant overstory consisting of Wyoming big sagebrush and a subdominant understory consisting of Hood's phlox, Mojave prickly pear, squirreltail, and Sandberg's bluegrass. The average foliar cover for this community is approximately 32 percent (range: 27 to 42), and the estimated annual forage production is 1,272 pounds per acre.

The basin big sagebrush/Great Basin wildrye community is located in intermittent drainage bottoms within the project area. This community experiences intermittent flooding during periods of runoff resulting from heavy precipitation events and snowmelt. This community includes a dominant overstory consisting of basin big sagebrush and green rabbitbrush and a subdominant understory consisting of Great Basin wildrye and cheatgrass. The average foliar cover for this community is approximately 40 percent (range: 34 to 50), and the estimated annual forage production is 1,271 pounds per acre.

The winterfat/grassland community occurs on gently sloping, alluvial fans that are dissected by intermittent drainages. This community is characterized by a dominant overstory consisting of Wyoming big sagebrush and a subdominant understory consisting of Hood's phlox, Mojave prickly pear, squirreltail, and Sandberg's bluegrass. The average foliar cover for this community is approximately 32 percent (range: 27 to 42), and the estimated annual forage production is 1,272 pounds per acre.

The majority of the existing East and West Waste Rock disposal areas have been reclaimed; portions of these reclaimed areas occur within the mine expansion area. These reclaimed areas consist of a mixture of grasses, forbs, and shrubs with localized plantings of trees.

These plant communities roughly correspond to the range sites described by the NRCS. Descriptions of the range sites are provided in Section 3.7, Range Resources. Additional discussion of woodland resources is provided in Section 3.8, Woodland Products.

3.6.1.2 Special Status Species

Special status species are those species for which state and federal agencies afford an additional level of protection by law, regulation, or policy. Included in this category are federally listed and federally proposed species that are protected under the Endangered Species Act (ESA), or are considered candidates for such listing by the U.S. Fish and Wildlife Service (USFWS), and BLM sensitive species.

In accordance with the ESA, as amended, the lead agency (BLM) in coordination with the USFWS must ensure that any action that they authorize, fund, or carry out would not adversely affect a federally listed threatened or endangered species. In addition, as stated in Special Status Species Management Policy 6840 (6840 Policy) (Rel. 6-121), it also is BLM policy “to conserve listed species and the ecosystems on which they depend, and to ensure that actions requiring authorization or approval by the BLM are consistent with the conservation needs of special status species and do not contribute to the need to list any special status species, either under the provisions of the ESA or other provisions” identified in 6840 Policy. The BLM has been under information consultation with the USFWS as outlined by Section 7 of the ESA. The following discussion summarizes known data for the sensitive plant species initially identified for the Proposed Action by the applicable agencies.

A total of seven special status plant species were identified as potentially occurring within the project area (BLM 2004a; Nevada Natural Heritage Program [NNHP] 2004; USFWS 2004). These species, their associated habitats, and their potential for occurrence within the project area are summarized in **Table 3.6-1**. Occurrence potential in the project area and cumulative impact area was evaluated for each species based on their habitat requirements and/or known distribution. Based on these evaluations, six of the special status plant species were eliminated from detailed analysis. The seventh species is a BLM sensitive species.

Nevada Willowherb

An occurrence of Nevada willowherb is known in the Diamond Mountains of Eureka County, approximately 35 miles north of the project area. Nevada willowherb occurs on limestone soils, talus, cliffs, and rock outcrops, with slopes of varying steepness from 5 to 45 percent. Most recorded occurrences for the species are found at elevations ranging from 7,000 to 9,200 feet amsl. However, one location for the species was recorded at 6,000 feet in the Clover Mountains in Lincoln County, Nevada. Plants associated with Nevada willowherb include piñon pine, ponderosa pine, and Clokey's wavy-leaf paintbrush. Several of these associated species have been identified at the lower elevations in the project area at approximately 6,200 to 7,200 feet amsl. The Nevada willowherb was identified as having low potential for occurrence in the project area; field surveys conducted in 1995 and 2004 within the project area did not identify any individuals (JBR Environmental Consultants, Inc. [JBR] 2004b; WESTEC 1995b).

3.6.2 Environmental Consequences

3.6.2.1 Proposed Action

General Vegetation

Mine expansion development and operation would disturb or remove approximately 744 acres of vegetation (**Table 3.6-2**). The juniper woodland/black sagebrush and Wyoming big sagebrush communities are the predominant plant communities that occur within the project area. Mine development and operation would result in the conversion of tree- and shrub-dominated communities and to grass/forb-dominated communities. Mine development and operation would remove or disturb approximately 451 acres of tree-dominated communities, which include the juniper woodland/black sagebrush and juniper woodland/Wyoming big sagebrush communities. Trees that occur in these woodland communities primarily consist of mature Utah juniper and singleleaf pinon trees that are typically 25 to 100 years old. Immature Utah juniper and singleleaf pinon trees also occur in these communities, which typically occur at lower elevations within the project area. Based on the low survival rate of tree seedlings planted in the existing waste rock disposal areas at the Ruby Hill Mine, the planting of Utah juniper and singleleaf pinon seedlings is not proposed for the mine expansion. The natural re-colonization of the waste rock disposal areas with Utah juniper and singeleaf pinon seedlings would be allowed to occur over the long term. Therefore, the removal of trees from these communities would be a long-term impact since it would take approximately 25 to 50 years for mature Utah juniper and singleleaf pinon trees to become reestablished in the project area.

Table 3.6-1
Special Status Plant Species that Potentially Occur in the Project Area

Common Name/ Scientific Name	Status[1]	Range/Habitat Requirements	Potential for Occurrence in or Near the Project Area	Eliminate from Detailed Analysis
Elko rockcress *Arabis falcifructa*	BLM	Range: Known only from northeast Elko County and from the western foothills of the Toiyabe Range in Lander County. Habitat: Dry, densely vegetated, undisturbed soils with a high cover of moss and cryptogrammic soil crust on moderate to steep north-facing slopes in the sagebrush zone, dominated by mosses and sagebrush. Elevations from 5,300 to 6,100 feet amsl. Requires dense moss cover.	None. The project is located outside of the species' geographic range and suitable habitat does not occur in the project area.	Yes
Eastwood milkweed *Asclepias eastwoodiana*	BLM	Range: Reported from central Lander County and northern Nye County, Nevada. Habitat: Open barren type clay and calcerous slopes frequently in small washes or other moisture-accumulating micro sites.	Unlikely to none. The project area is located approximately 70 miles east and north of the areas of reported occurrences. During a recent field survey conducted in the project area for weed species, no *Asclepias* species were observed (JBR 2004b).	Yes
Nevada willowherb *Epilobium nevadense*	BLM	Range: Has been recorded from extreme western Eureka County, and in Clark and Lincoln counties, Nevada. Habitat: Generally 7,000 to 8,900 feet amsl on slopes with limestone outcrops associated with singleleaf piñon pine and Ponderosa pine. The Eureka County occurrence was from 6,000 feet amsl.	Low. The project area is located outside of the species' elevational and geographic range; however, one occurrence has been reported at an elevation comparable with that of the project area. The species was not observed in the project vicinity during field surveys associated with the baseline studies (JBR 2004b; WESTEC 1995a).	No
Windloving buckwheat *Eriogonum anemophilum*	BLM	Range: Reported from Churchill, Humboldt, Lander, Pershing, and Washoe counties, Nevada. Habitat: Broad elevational range, 4,700 feet to 9,800 feet amsl. At high elevations, occurs on dry, exposed, relatively barren and undisturbed, gravelly, limestone or volcanic ridges and ridgeline knolls, on outcrops or shallow rocky soils over bedrock. At low elevations, occurs on dry, relatively barren and undisturbed knolls and slopes of light-colored, platy volcanic tuff weathered to form stiff clay soils.	None. The project area is located east of the areas of reported occurrence. Suitable habitat is not present in the project area.	Yes

Table 3.6-1 (Continued)

Common Name/ Scientific Name	Status	Range/Habitat Requirements	Potential for Occurrence in or Near the Project Area	Eliminate from Detailed Analysis
Ligulate feverfew *Parthenium ligulatum*	BLM	Range: Known from Colorado and Utah. Habitat: Barren shale knolls, also barren clay or sandy-clay slopes and flats in piñon-juniper communities.	None. The project area is located outside of the species geographic range. The project area does not include suitable habitat for this species, based on a recent field survey of the project area (JBR 2004b).	Yes
Tiehm beardtongue *Penstemon tiehmi*	BLM	Range: Reported only from high elevations in northern Lander County. Habitat: Elevations 7,500 to 9,500 feet amsl. On sandy-loam soils pockets on steep, south-facing volcanic talus and scree slopes.	None. The project area is located outside of the species elevational and geographic range and does not include suitable habitat for the species.	Yes
Starveling milkvetch *Astragalus jejunus* var. *jejunus*	NNHP	Range: Wyoming, Utah, Idaho, and a disjunct range in Nevada from northeast Elko County and from the White Pine Mountains, White Pine County, Nevada. Habitat: Dry barren ridges and bluffs of shale, sandstone, clay, or cobblestones. Elevational range is 6,000 to 7,100 feet amsl.	None. The project area is located outside of the species' geographic range in Nevada. Also, suitable habitat does not exist in the project area based on recent field survey conducted in the project area (JBR 2004b).	Yes

[1]BLM = BLM sensitive species.
NNHP = NNHP – Vulnerable.

Table 3.6-2
Acres of Vegetation Disturbed or Removed by the Proposed Action

Mine Component	Plant Communities[1]					
	JW/BS	JW/WBS	WBS/G	BBS/GBW	W/G	Total Acreage
Pit Expansion	92.3	0	2.8	4.8	0	99.9
Pit Activity Area	36.0	0	0.4	2.2	0	38.6
East Waste Rock Disposal Expansion Area	97.9	0	16.4	4.3	0	118.6
West Waste Rock Disposal Expansion Area	154.7	54.2	82.4	0	0	291.3
Heap Leach Expansion/Overflow Pond	3.2	9.0	48.5	0	0	60.7
Haul Road with Lime Silo	2.8	0	1.2	0	0	4.0
Power Line Realignment	0.1	0.6	0.7	0	0	1.4
Growth Media Stockpile	0	0	10.8	0	0	10.8
Diversion Channels[2]	0	0	0	0	0	0
Soil Borrow Area	0	0	66.2	0	52.0	118.2
Total	**387.0**	**63.8**	**229.4**	**11.3**	**52.0**	**743.5**

[1] Plant communities include:
JW/BS = Juniper woodland/black sagebrush
JW/WBS = Juniper woodland/Wyoming big sagebrush
WBS/G = Wyoming big sagebrush/grassland
BBS/GBW = Basin big sagebrush/Great Basin wildrye
W/G = Winterfat/grassland

[2] Diversion channels would be installed/realigned, as needed.

The Wyoming big sagebrush/grassland, basin big sagebrush/Great Basin wildrye, and winterfat/grassland communities are dominated by mature shrubs that are approximately 15 to 50 years old. Mine development and operation would remove approximately 293 acres of shrub-dominated communities. The removal of shrubs would be a long-term impact since it would take approximately 15 to 20 years after reclamation to establish mature shrubs in the project area.

Reclamation would be completed for 680 asbuilt acres (approximately 644 plan view acres) of the total disturbance area (Section 2.3.15, Reclamation). The approximately 100-acre mine pit expansion area would be the only project component that would not be reclaimed. Successful revegetation of disturbed land is anticipated to occur approximately 3 to 5 years after reclamation. Reclamation activities would consist of the grading of final slopes; ripping of compacted soil; potential reapplication of growth media; and broadcasting of seed. Seed mixtures, as described in Section 2.3.15.5, Seeding Mixtures and Rates, would be used for revegetation activities. In addition, plantings of shrub seedlings would be planted primarily along the north- and west-facing slopes of the waste rock disposal expansion areas to provide structural and species diversity to the reclaimed plant communities. After 3 to 5 years, the reclaimed plant communities likely would consist of adequate herbaceous plant cover with sufficient diversity to substantially reduce the potential for soil erosion and provide forage for use by livestock and wildlife.

No riparian areas or wetlands occur within the project area. Therefore, impacts to riparian areas or wetlands would not occur as a result of mine expansion development or operation. Project development and operation would result in the filling and excavation of small intermittent drainages that support upland vegetation.

Implementation of Homestake's weed control program in conjunction with the reclamation plan substantially would reduce the potential for noxious weed establishment in the project area (Section 2.3.15.6, Weed Control). However, minor populations of weedy annual species (e.g., halogeton, cheatgrass) may become established in localized areas for short periods of time.

Special Status Species

Based on habitat requirements and/or known distribution, only one special status plant species (Nevada willowherb) was identified as having potential for occurrence within the project area (see **Table 3.6-1**). Field surveys conducted for this species in 1995 and 2004 by WESTEC and JBR, respectively, within the project area did not identify any individual plants. Based on the results of these surveys, impacts to special status plant species would not occur as a result of development and operation of the proposed mine expansion.

3.6.2.2 No Action Alternative

General Vegetation

Under the No Action Alternative, the proposed mine expansion would not be developed, and associated impacts to vegetation would not occur. No additional surface disturbance or related impacts to vegetation would occur with the ongoing mineral processing and reclamation under this alternative. Ongoing reclamation would help to minimize existing impacts to vegetation in mine-related disturbance areas (with the exception of the mine pit), with resulting short-term impacts to herbaceous species and long-term impacts to woody species.

Special Status Species

As the proposed mine expansion would not occur under this alternative, and no additional surface disturbance would occur in association with ongoing operations at the existing Ruby Hill Mine, there would be no impact to potential habitat for the Nevada willowherb under this alternative.

3.6.3 Cumulative Impacts

General Vegetation

The cumulative impact area for vegetation, as shown in **Figure 3.5-2**, encompasses approximately 16,502 acres. Interrelated projects are identified in **Table 2-9**. Past and present interrelated projects within the cumulative impact area have resulted in 3,868 acres of disturbance to vegetation, or disturbance to approximately 23 percent of the vegetation in the cumulative impact area. No RFFAs have been identified in the cumulative impact area that would have a cumulative interaction with the Proposed Action on vegetation resources. The Proposed Action incrementally would increase surface disturbance and related impacts to vegetation in this area by an additional approximately 744 acres, resulting in an overall disturbance to vegetation on 4,612 acres (28 percent) in the cumulative impact area. It is assumed that portions of past disturbances have been reclaimed, and ongoing reclamation at the existing Ruby Hill Mine would continue to reduce the impacts to vegetation in that area. The incremental addition of vegetation impacts as a result of the Proposed Action would be temporary in nature for the majority of the expansion area (with the exception of the pit expansion), pending completion of successful reclamation, and the loss of mature trees and shrubs would be minimal relative to the total acreage of woody species communities that occur in the cumulative impact area.

Special Status Species

Cumulative impacts to special status species would not occur since these species would not be affected by the Proposed Action.

3.6.4 Mitigation and Monitoring

Monitoring and mitigation measures have not been identified since the reclamation activities are included as part of the Proposed Action and substantially would reduce potential impacts to vegetation resources.

3.6.5 Residual Adverse Impacts

Residual impacts to vegetation would include the permanent loss of vegetative productivity from approximately 100 acres of land associated with the pit expansion that would not be reclaimed and a change in vegetation composition (i.e., tree and shrub-dominated communities to grass- and forb-dominated communities) as a result of mine development and operation.

3.7 Range Resources

The range resources study area for direct and indirect impacts is the existing Ruby Hill Mine study area, which includes the proposed mine expansion area. The cumulative impact area encompasses the 16,502-acre Ruby Hill Allotment, which includes 13,945 acres of BLM-administered land and 2,557 acres of private land.

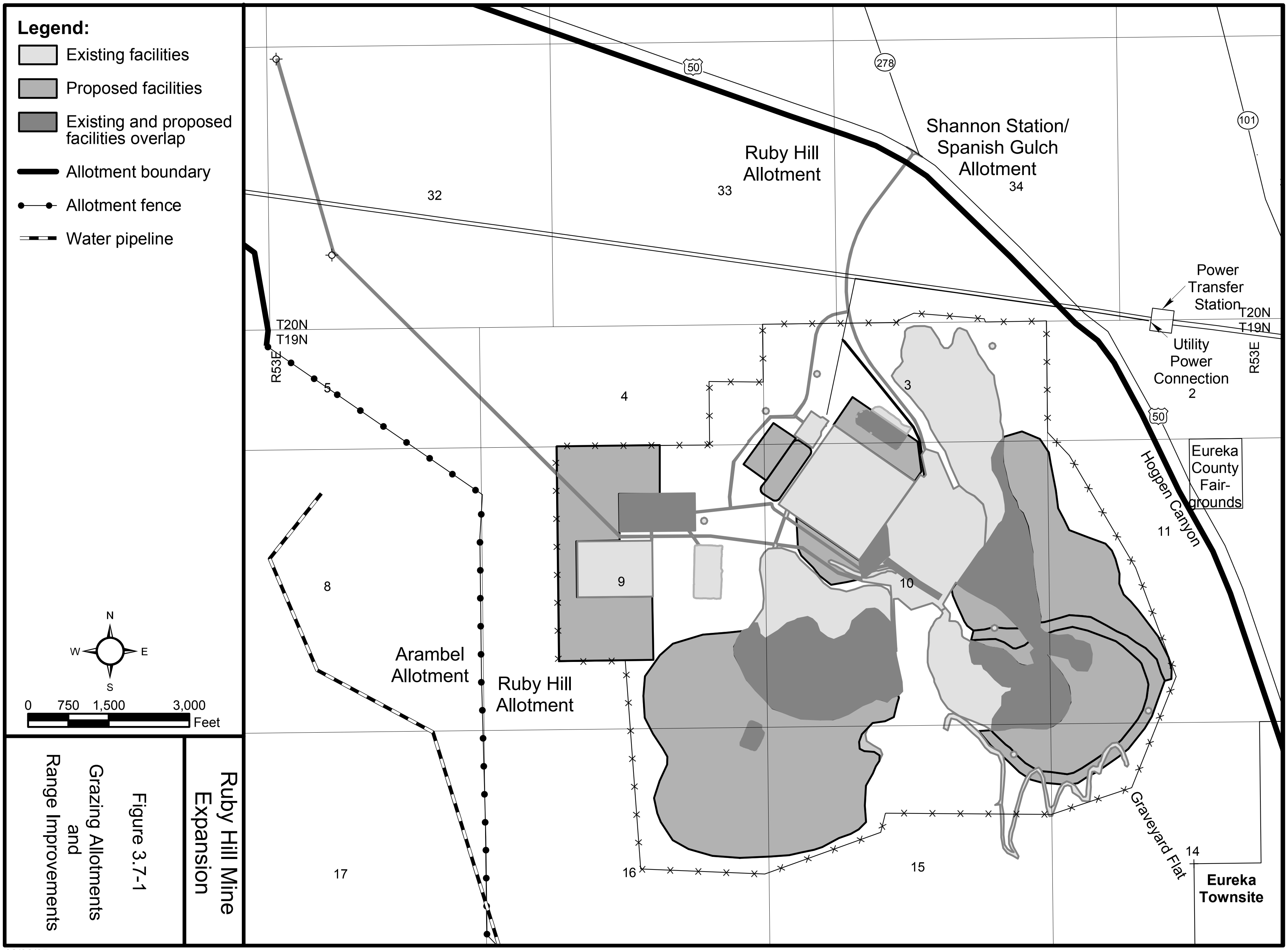
3.7.1 Affected Environment

The proposed expansion area is open to livestock grazing and is located in the Ruby Hill Allotment (**Figure 3.7-1**). This allotment is bounded by the Fish Creek Ranch Allotment to the south, Arambel and Lucky C allotments to the west, and the Shannon Station/Spanish Gulch Allotment to the north and east. The Ruby Hill Allotment includes 13,945 acres of public land, including the extreme southern portion of Diamond Valley and the northern portion of the Fish Creek Range. The allotment is approximately 3 miles wide extending east to west and 14 miles extending north to south. The Ruby Hill Allotment is classified as an "M" (maintain) category allotment. An "M" classification indicates the objective is to maintain current satisfactory conditions. Allotments are evaluated periodically to ensure that management objectives are being reached and that range improvements are done on those allotments with the greatest potential for improvement in resource conditions and return on investment.

The Ruby Hill Allotment is leased by one permittee. The permittee exclusively grazes sheep within the allotment. The current active grazing preference (i.e., allowable animal unit months) for the Ruby Hill Allotment includes 1,286 animal unit months of which 1,011 and 275 animal unit months were originally designated for sheep and cattle, respectively. Current sheep grazing operations within the allotment include approximately 1,100 ewe/lamb pairs (i.e., ewe with 1 or 2 lambs) grazing for 5 months (i.e., May through September) or the equivalent of 1,100 animal unit months. Rangeland in the project vicinity is grazed once during the growing season for approximately 3 to 5 days during early May (Larralde 1996). The average stocking rate for the entire allotment is 10.3 acres per animal unit month.

The allotment includes few range improvement facilities or developed areas (i.e., improved springs, stock ponds, water troughs, fences, and cattle guards) that enhance grazing activities. One water pipeline and two improved springs are located in the allotment (**Figure 3.7-1**); the water pipeline is located approximately 1.1 miles to the west, and the two springs are located approximately 4.3 miles to the southeast of the project area. Range improvement facilities or developed areas do not occur in the project area. Livestock mortalities resulting from traffic accidents have not been reported in the project area (Larralde 1996).

An ecological site inventory was conducted for several plant communities located within the project area; they include the juniper woodland/black sagebrush, juniper woodland/Wyoming big sagebrush, Wyoming big sagebrush/grassland, basin big sagebrush/Great Basin wildrye, and winterfat/grassland communities. Range sites (i.e., ecological sites) are ecologic units that are differentiated by soil, vegetation, and climatic factors, which directly influence forage production. The ecological site inventory was conducted for two range sites within the project area including the calcareous loam, 10- to 14-inch precipitation zone (28BY094) and shallow calcareous loam, 10- to 14-inch precipitation zone (28BY006) sites. The juniper woodland/Wyoming big sagebrush, Wyoming big sagebrush/grassland, and winterfat/grassland communities are associated with the calcareous loam, 10- to 14-inch precipitation zone range site, and the



Ruby Hill Mine Expansion

Figure 3.7-1

Grazing Allotments and Range Improvements

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juniper woodland/black sagebrush and basin big sagebrush/Great Basin wildrye communities are associated with the shallow calcareous loam, 10- to 14-inch precipitation zone range site. Forage production estimates for each native plant community include the following (WESTEC 1994):

- Juniper woodland/black sagebrush - 671 pounds/acre
- Juniper woodland/Wyoming big sagebrush - 367 pounds/acre
- Wyoming big sagebrush/grassland - 1,272 pounds/acre
- Basin big sagebrush/Great Basin wildrye - 1,271 pounds/acre
- Winterfat/grassland - 823 pounds/acre

3.7.2 Environmental Consequences

3.7.2.1 Proposed Action

Prior to development of the proposed mine expansion, the existing mine perimeter fence would be expanded to include the proposed mine expansion components and additional land adjacent to these components (approximately 997 acres). This fence would exclude livestock grazing during mine construction, operation, and reclamation. The 997 acres of rangeland to be excluded from livestock grazing would include approximately 646 acres of private land and approximately 351 acres of BLM-administered land.

Development and operation of the proposed mine expansion would result in the temporary loss of 34 animal unit months on BLM-administered land, which would reduce the active grazing preference within the Ruby Hill Allotment from 1,286 to 1,252 animal unit months. The temporary loss of 34 animal unit months within the grazing allotment would represent less than 3 percent of the active grazing preference.

The current active grazing preference for the Ruby Hill Allotment includes 1,286 animal unit months, of which 1,011 and 275 animal unit months originally were designated for sheep and cattle, respectively. Current sheep grazing operations within the allotment include 1,100 ewe/lamb pairs or the equivalent of 1,100 animal unit months. Approximately 257 of the 275 animal unit months originally designated for cattle are not currently being utilized within the allotment. Approximately 18 of the animal unit months designated for cattle have been utilized by allowing additional sheep to graze within the allotment. An additional 257 animal unit months have not utilized for cattle grazing. Therefore, the temporary loss of 34 animal unit months during mine development and operation would not affect current grazing operations within the Ruby Hill Allotment.

The majority of disturbed land (approximately 644 acres) within the project area would be reclaimed (see Section 2.3.15, Reclamation). Successful revegetation of disturbance on BLM-administered lands would increase plant cover and provide an adequate amount of forage to recover 31 of the 34 animal unit months lost during mine development. Livestock grazing may be resumed after re-established vegetation is capable of supporting grazing (i.e., three to five growing seasons after final revegetation).

A perimeter fence would be constructed around the mine pit expansion and pit activity area following the completion of mining. This 139-acre fenced area would exclude livestock from grazing the area, which includes 110 acres of private land and 29 acres of BLM-administered land. As a result of the exclusion of

29 acres of BLM-administered land, the active grazing preference would be permanently reduced by 3 animal unit months to 1,283 animal unit months, which could limit future expansion of the current grazing operation. The permanent loss of 3 animal unit months would represent less than 1 percent of the active grazing preference for the allotment. The exclusion of 110 acres of private land from grazing would not result in the loss of animal unit months within the grazing allotment.

Reduction in the available range land within the allotment is not expected to cause degradation of the vegetation resource since the current use of the area is already below permit limits. The reduced number of animal unit months would be considered during the formal allotment evaluation process. Removal of rangeland from the grazing allotment could direct the remaining livestock use into smaller portions of the allotments, and access to the northern portion of the allotment may be slightly constricted due to the expansion of the perimeter fence that would encompass the mine expansion area.

No impacts to existing range improvements are anticipated since all current improvements lie outside of the area of direct impact. The two springs present within the southern portion of the Ruby Hill Allotment would not experience reduced water flows as a result of groundwater drawdown (see Section 3.4, Water Quality and Quantity).

3.7.2.2 No Action Alternative

Under the No Action Alternative, impacts to range resources would not occur from development and operation of the Proposed Action. Impacts would be limited to those associated with ongoing, permitted mining activities.

3.7.3 Cumulative Impacts

The cumulative impact area for range resources is shown in **Figure 3.5-2**. Interrelated projects are identified in **Table 2-9**. Past disturbances within the Ruby Hill Allotment boundary include approximately 2,735 acres that were disturbed during previous mining and other development activities. The disturbance accounts for approximately 17 percent of the cumulative impact area. Assuming that approximately 85 percent (2,325 acres) of the land disturbed by these past actions would be successfully reclaimed, the permanent disturbance area would be reduced to 410 acres, or approximately 2 percent of the allotment. Disturbances resulting from past actions would result in the permanent loss of 40 animal unit months or less than 3 percent of the active grazing preference.

Present actions within the Ruby Hill Allotment would disturb approximately 1,133 acres, or approximately 7 percent of the allotment. The majority (960 acres) of this disturbance would occur within the existing mine area on private land owned by Homestake. Approximately 173 acres of disturbance associated with ongoing mineral exploration is located on public land. It is assumed that this disturbance would be reclaimed; therefore, no animal unit months would be permanently lost.

The Proposed Action incrementally would increase the temporary and permanent loss of animal unit months in the Ruby Hill Allotment. A total of 351 acres of vegetation located on BLM-administered land and 646 acres of vegetation located on private land would not be available for livestock grazing during the life of the mine, resulting in a temporary loss of 34 animal unit months. A total of 139 acres of land permanently would be excluded from grazing, which would include 110 acres of private land and 29 acres of BLM-administered land. The exclusion of 29 acres of BLM-administered land would result in the permanent loss of 3 animal unit months, which would represent less than 1 percent of the active grazing preference.

One identified RFFA would include the potential sale of approximately 400 acres of BLM-administered land to Homestake. If the land sale is approved, as would be determined under a separate NEPA analysis, 400 acres of rangeland within the BLM-administered Ruby Hill Allotment would be transferred from public ownership to private ownership. As stated for the Proposed Action, a total of 29 acres of BLM-administered rangeland associated with the proposed pit expansion permanently would be excluded from livestock grazing, resulting in the long-term loss of 3 animal unit months. Since these 29 acres are part of the 400 acres associated with the potential land sale, the land sale would result in an additional 371 acres of rangeland that would be excluded from livestock grazing, with an associated 36 animal unit months permanently lost.

A combined total of 810 acres of land would not be available for livestock grazing as a result of past, present, RFFAs, and proposed mining activities in the cumulative impact area. This represents approximately 6 percent of the total land available for grazing in the Ruby Hill Allotment and would result in the permanent loss of 79 animal unit months.

3.7.4 Mitigation and Monitoring

No monitoring or mitigation measures for range resources are recommended since no substantial impacts are anticipated.

3.7.5 Residual Adverse Impacts

Residual impacts for range resources would include the permanent loss and exclusion of forage from 29 acres of BLM-administered land within the 139-acre pit and pit activity area, which would result in the permanent loss of 3 animal unit months on BLM-administered land.

3.8 Woodland Products

The woodland resources study area for direct and indirect impacts is the existing Ruby Hill Mine study area, which includes the proposed mine expansion area. The cumulative impact area includes the area within a 45-mile radius of the Eureka townsite (e.g., the area within an approximate 1-hour drive from this population center).

3.8.1 Affected Environment

The majority of the woodland resources occurring in the BLM Battle Mountain District, including the project area, are composed of the piñon-juniper woodland type with occasional mountain mahogany. Within the District, the harvesting of live trees for fuelwood only can occur in designated fuelwood areas. Down or dead wood can be cut anywhere within the District, except within WSAs. Fence posts also can be cut only in designated greenwood (i.e., fuelwood) areas. Piñon pine nuts can be harvested by the public anywhere within the District except within WSAs. Commercial piñon pine nut harvesters bid on specific areas and must harvest only in those areas.

Woodlands in the project area currently are open for the cutting of Christmas trees. Woodlands in the project area are not open for the cutting of live trees for fuelwood or fence posts or for the harvesting of piñon nuts. Dead or fallen trees may be cut for fuelwood or fence posts. Demand for woodland product harvesting in the region is high, because woodstoves heat many homes in the town of Eureka. An estimated 600,000 acres of piñon-juniper woodlands are classified as forest available for woodland product management within the planning area, of which less than 120,000 acres is accessible for woodland harvest (BLM 1986a).

The BLM's Shoshone-Eureka RMP recognizes that woodland areas may be cleared as a result of actions that would result in increased benefit to other resource values (BLM 1986a). Clearing of woodlands for the construction of a mine operation (such as the Proposed Action) would meet this criterion.

The majority of forested land that occurs within the project area consists of singleleaf piñon (*Pinus monophylla*) and Utah juniper (*Juniperus osteosperma*) woodlands. These species are associated with the juniper woodland/black sagebrush and juniper woodland/Wyoming big sagebrush plant communities that occur at elevations ranging between 6,200 feet amsl in the northern portion of the project area, to 7,200 feet amsl in the southern portion of the project area.

As part of baseline data collection efforts for permitting of the original Ruby Hill Mine, WESTEC performed a woodland inventory of forested portions of the project area that would be disturbed by the Proposed Action (WESTEC 1995a). The objective of the woodland inventory was to estimate the volume (in cubic feet) of woodland resources potentially lost as a result of development of the original Ruby Hill Mine. A general field review of woodland communities in the proposed expansion area subsequently was conducted in July 2004 (JBR 2004a).

JBR (2004a) identified two locations in the project area that supported Utah juniper and singleleaf piñon trees with sufficient densities and maturity to be considered woodland, including a portion of the West Waste Rock Disposal Area expansion and a portion of the pit expansion/East Waste Rock Disposal Area.

Woodlands identified in the southeastern portion of the West Waste Rock Disposal Area are in good health and consist of singleleaf piñon trees with an average height of 15 feet and approximate canopy cover of 20 to 25 percent, as well as Utah juniper trees with an average height of 8 feet and approximate canopy cover of 15 percent. Woodlands in the southeastern portion of the pit expansion area are in poor health and primarily consist of Utah juniper trees with an average height of 8 to 10 feet and approximate canopy cover of 50 to 60 percent. These woodlands also include singleleaf piñon trees with an average height of 10 feet and approximate canopy cover of 10 percent. Woodlands in the East Waste Rock Disposal Area are in fair to good health and consist of Utah juniper trees with an average height of 10 feet and approximate canopy cover of 20 to 45 percent as well as piñon trees with an average height of 15 to 20 feet and approximate canopy cover of 20 percent (JBR 2004a).

In the proposed project area, Utah juniper is the dominant woodland overstory species at lower elevations; singleleaf piñon is the dominant woodland overstory species at higher elevations. The BLM has estimated that Utah juniper in the proposed expansion area would yield an average of 43 fence posts per acre. **Table 3.8-1** summarizes the estimated volume of other woodland species within these two portions of the project area. These woodlands currently are considered accessible as a result of the numerous access roads within the project area.

Table 3.8-1
Number and Volume of Woodland Species in the Project Area

Species	Relative Elevation of Project Area	Feet in Height Per Acre	Total Number of Trees Per Acre	Volume[1] (cubic feet/acre)
Singleleaf piñon	Lower	2	3	3.48
	Higher	35	122	70.77
Mountain mahogany	Higher	1	1	0.36

Source: JBR 2004a.

[1]Volume only provided for trees greater than or equal to 4 feet in height and 4 inches in diameter at the root collar.

3.8.2 Environmental Consequences

3.8.2.1 Proposed Action

The Proposed Action would result in the long-term loss of productivity on approximately 451 acres of woodlands. This figure is based on projected mine expansion-related disturbance within both juniper woodland/black sagebrush and juniper woodland/Wyoming big sagebrush plant communities. The primary woodland impact would result from the construction of the pit expansion area and expansion of the East Waste Rock Disposal Area and West Waste Rock Disposal Area. This long-term change in vegetation, however, would represent less than 1 percent of the manageable woodland in the planning area.

The majority (285 acres) of the 451 acres of woodland that would be removed under the Proposed Action would occur on private land owned by Homestake, and 166 acres would occur on BLM-administered land. As stated in Section 3.8.1, Affected Environment, BLM-administered woodlands in the project area are not open to the public for the cutting of live trees for fuelwood or fence posts or for pine nut harvesting.

Singleleaf piñon trees present on BLM-administered land within the project area would be removed during mine development and would not be available for Christmas tree cutting by the public in the long term.

The long-term change in vegetation and loss of woodland product productivity would not result in substantial impacts since the Proposed Action is located within an area where abundant piñon-juniper woodlands exist on public lands.

Other portions of the project area, with the exception of the pit expansion area, are proposed to be reclaimed with grass and forb seed mixes and planted with shrub seedlings. In addition, trees would be allowed to naturally recolonize disturbance areas over the long term. The amount of time before these areas would be capable of supporting productive woodland vegetation would be on the order of 75 to 100 years. The pit expansion area would represent an approximately 92-acre area (of which approximately 25 acres would be on BLM-administered land) where woodland species would be removed and the potential for the regeneration of productive woodland vegetation would never be realized.

3.8.2.2 No Action Alternative

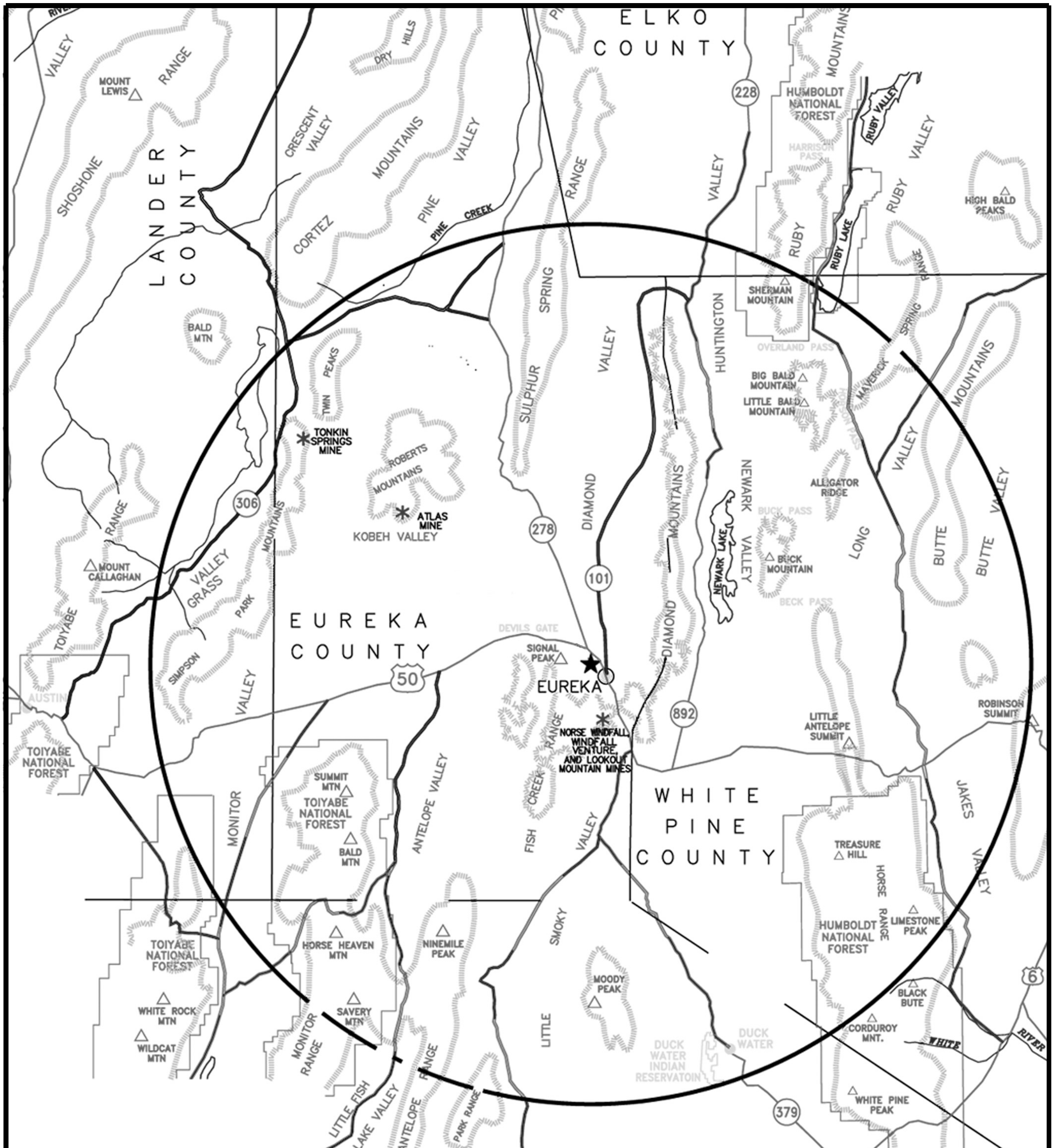
Under the No Action Alternative, disturbance associated with the Proposed Action and the anticipated loss of woodland products would not occur. No additional disturbance to woodlands would occur under this alternative. Although existing disturbance areas would continue to be reclaimed, previous impacts to woodlands associated with development of the existing Ruby Hill Mine would continue to represent a long-term impact due to the time required for reestablishment of productive woodland vegetation (approximately 75 to 100 years).

3.8.3 Cumulative Impacts

The cumulative impact area for woodland products is shown in **Figure 3.8-1**. Interrelated projects are identified in **Table 2-9**. Interrelated projects in the cumulative impact area have, or would, result in an additional loss of woodland products from public lands. Extensive cutting of piñon and juniper trees has occurred adjacent to the town of Eureka and the Ruby Hill mine as part of a BLM fire management plan. The extent that interrelated projects have, or would, affect known woodland resources cannot be quantified. It can be assumed, however, that cumulative development alone has resulted in the removal of approximately 1 percent of the total harvest base from production of woodland products within the planning area. Based on the current low population and low demand regionally for piñon-juniper woodland products, current and future demand by Eureka area residents would continue to be met by the relatively large amount of public lands that remain available for woodland harvest.

3.8.4 Mitigation and Monitoring

No adverse impacts to woodland products that warrant monitoring or mitigation have been identified as a result of the Proposed Action.



Legend

- ★ Ruby Hill Mine expansion location
- ★ Ruby Hill land sale (past disturbance)
- ★ BLM fire management program area (past disturbance)

N
W E
S

0 15 Miles

Ruby Hill Mine Expansion

Figure 3.8-1

Cumulative Impact Area for Woodlands, Recreation, and Wilderness

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3.8.5 Residual Adverse Impacts

Residual impacts to woodland products would include the long-term loss of approximately 451 acres of woodland within the project area, of which 285 acres and 166 acres would occur on private and BLM-administered land, respectively. Singleleaf piñon trees present on BLM-administered land within the project area would be removed during development of the mine expansion and would not be available for Christmas tree cutting by the public in the long term.

3.9 Invasive and Non-native Species

The invasive and non-native species study area for direct and indirect impacts is the existing Ruby Hill Mine study area, which includes the proposed mine expansion area. The cumulative impact area encompasses the 16,502-acre Ruby Hill grazing allotment, which includes 13,945 acres of BLM-administered land and 2,557 acres of private land.

3.9.1 Affected Environment

Invasive and non-native plant species infestations have been expanding across the U.S., including Nevada. Weeds create large economic losses for agriculture in both cropland and rangeland areas. Noxious weeds often provide poorer habitat for wildlife than native vegetation. The proliferation of non-native plant species alters ecosystem processes and threatens certain native species with extirpation.

As a result of the substantial economic losses associated with noxious weed infestations, the State of Nevada has enacted laws requiring control of noxious weeds (Nevada Revised Statue 555.005, NAC 555.010). When Nevada law defines a weed as "noxious," its distribution in commerce is prohibited and its control or management is mandated (University of Nevada, Reno Cooperative Extension 2003). In addition, the federal Noxious Weed Act of 1974, as amended (7 U.S. Code 2801 et seq.) requires cooperation with state, local, and other federal agencies in the application and enforcement of all laws and regulations relating to the management and control of noxious weeds. A list of the noxious weeds designated by the State of Nevada, BLM Battle Mountain Field Office, and Eureka County Department of Natural Resources is provided in **Table 3.9-1**.

The BLM considers plants invasive if they have been introduced into an environment where they did not evolve. As a result, invasive species usually have no natural enemies to limit their reproduction and spreading (Westbrooks 1998). Some invasive plant species can produce substantial changes to vegetation composition, structure, or ecosystem function (Cronk and Fuller 1995).

A baseline vegetation study, which included documentation of invasive species occurrences along representative vegetation transects, previously was conducted in the original Ruby Hill Mine baseline study area in 1995 by WESTEC Inc. (WESTEC 1995a). Noxious and invasive species that were observed in the project vicinity in 1995 included cheatgrass, spotted knapweed, and hoary cress. A detailed noxious weed and invasive species survey was not conducted within the project area in 1995. In 2003, the BLM completed an EA for the sale of BLM-administered land to Homestake, which described the potential for noxious and invasive species to occur in the project area based on published reports for Eureka County, Nevada (BLM 2003a). An invasive and non-native plant survey of the proposed expansion area was conducted in June 2004 (JBR 2004b). The locations of noxious and invasive plants observed in the project area are illustrated in **Figure 3.9-1**.

Legally, a noxious weed is any plant designated by a federal, state, or county government as injurious to public health, agriculture, recreation, wildlife, or property. Only one noxious weed species (musk thistle) was observed in the project vicinity during the 2004 survey. Less than 25 musk thistle plants were observed at three locations in the project vicinity (JBR 2004b). This species previously has been observed in the project

Table 3.9-1
Designated Noxious and Invasive Plant Species

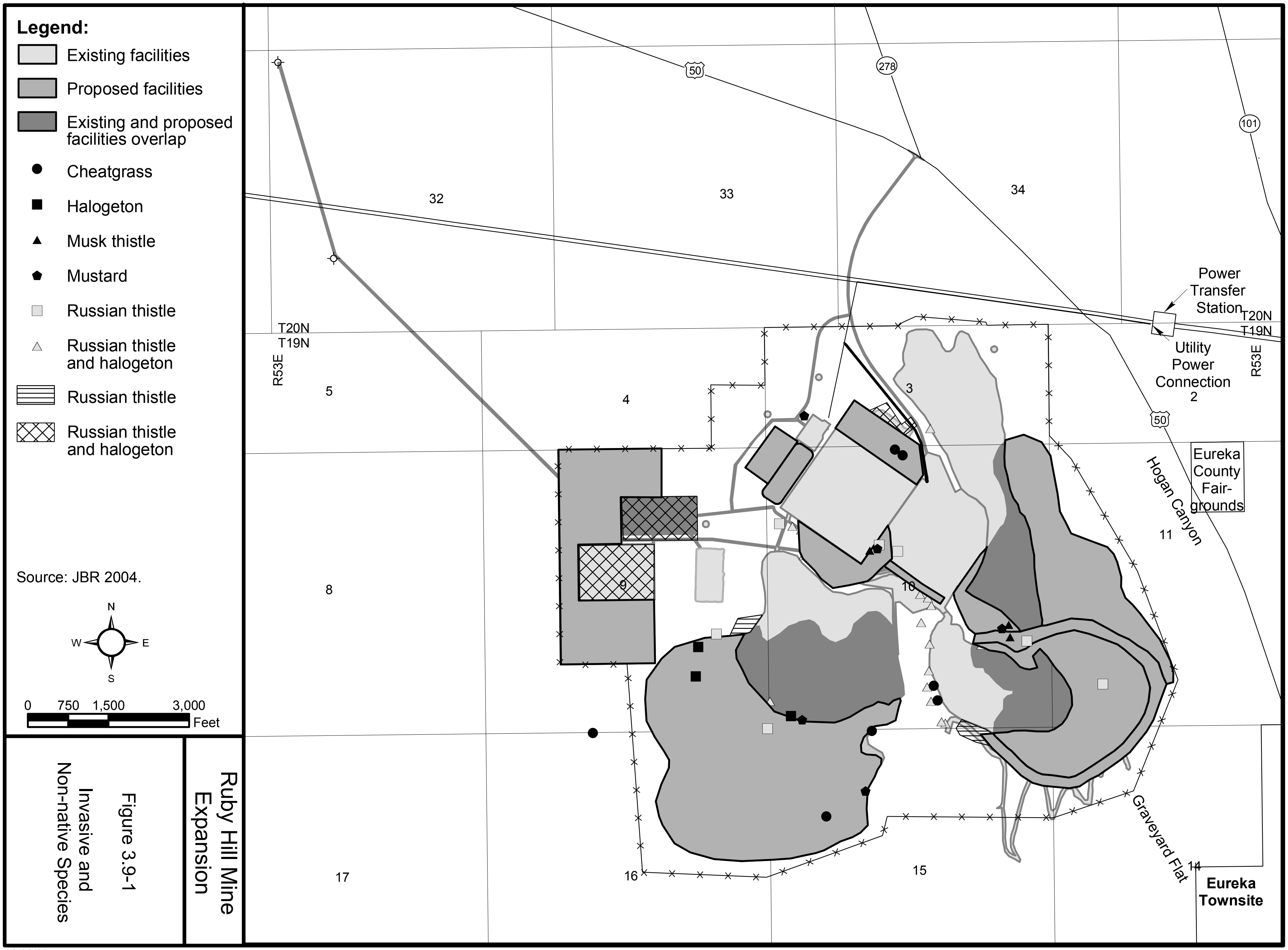
Common Name	Scientific Name	Status	Present in Project Area?[1]
African rue	*Peganum harmala*	Noxious	No
Anchored water hyacinth	*Eichhornia azurea*	Invasive	No
Austrian fieldcress	*Rorippa austriaca*	Noxious	No
Austrian peaweed	*Sphaerophysa salsula* *Swainsona salsula*	Noxious	No
Black henbane	*Hysocyamus niger*	Noxious	No
Broom snakeweed	*Gutierrezia sarothrae*	Invasive	No
Brassica	*Brassica elongata*	Invasive	Yes[2]
Bull thistle	*Cirsium vulgare*	Invasive	No
Camelthorn	*Alhagi camelorum*	Noxious	No
Canada thistle	*Cirsium arvense*	Noxious	No
Carolina horse nettle	*Solanum carolinense*	Noxious	No
Cheatgrass	*Bromus tectorum*	Invasive	Yes
Common cocklebur	*Xanthium strumarium*	Invasive	No
Common crupina	*Crupina vulgaris*	Noxious	No
Curly dock	*Rumex crispus*	Invasive	No
Dalmation toadflax	*Linaria dalmatica*	Noxious	No
Diffuse knapweed	*Centaurea diffusa*	Noxious	No
Dyer's woad	*Isatis tinctoria*	Noxious	No
Eurasian watermilfoil	*Myriophyllum spicatum*	Noxious	No
Field bindweed	*Convolvulus arvensis*	Invasive	No
Field dodder	*Cuscuta campestris*	Invasive	No
Foxtail barley	*Hordeum jubatum*	Invasive	No
Giant salvinia	*Salvinia molesta*	Noxious	No
Goats rue	*Galega officianalis*	Noxious	No
Green fountain grass	*Pennisetum setaceum*	Noxious	No
Green foxtail	*Setaria viridis*	Invasive	No
Halogeton	*Halogeton glomeratus*	Invasive	Yes
Hoary cress	*Cardaria draba*	Noxious	No
Houndstongue	*Cynoglossum officinale*	Noxious	No
Hydrilla	*Hydrilla verticillata*	Noxious	No
Iberian starthistle	*Centaurea iberica*	Noxious	No
Juniper	*Juniperus* spp.	Invasive	No
Kochia	*Kochia scoparia*	Invasive	No
Larkspur	*Delphinium* spp.	Invasive	No
Leafy spurge	*Euphorbia esula*	Noxious	No
Malta starthistle	*Centaurea melitensis*	Noxious	No
Mayweed chamomile	*Anthemis cotula*	Noxious	No
Musk thistle	*Carduus nutans*	Noxious	Yes
Mediterranean sage	*Salvia aethiopis*	Noxious	No
Medusahead	*Taeniatherum caput-medusae*	Noxious	No
Perennial pepperweed	*Lepidium latifolium*	Noxious	No
Poison hemlock	*Conium maculatum*	Noxious	No
Puncturevine	*Tribulus terrestris*	Noxious	No
Purple loosestrife	*Lythrum salicaria, Lythrum virgatum* and their cultivars	Noxious	No

Table 3.9-1 (Continued)

Common Name	Scientific Name	Status	Present in Project Area?
Purple starthistle	*Centaurea calcitrapa*	Noxious	No
Quackgrass	*Agropyron repens*	Invasive	No
Rush skeletonweed	*Chondrilla juncea*	Noxious	No
Russian knapweed	*Centaurea repens*	Noxious	No
Russian olive	*Elaeagnus angustifolia*	Invasive	No
Russian thistle	*Salsola kali* *Salsola iberica*	Invasive	Yes
Saltcedar	*Tamarix ramosissima, T. parviflora*	Noxious (BLM Invasive)	No
Scotch thistle	*Onopordum acanthium*	Noxious	No
Silky crazyweed	*Oxytropis sericea*	Invasive	No
Sixweek fescue	*Vulpia octoflora*	Invasive	No
Sorghum	*Sorghum* spp.	Noxious	No
Sow thistle	*Sonchus arvensis*	Noxious	No
Spotted knapweed	*Centaurea maculosa*	Noxious	No
Squarrose knapweed	*Centaurea virgata*	Noxious	No
St. Johnswort	*Hypericum perforatum*	Noxious	No
Sulfur cinquefoil	*Potentilla recta*	Noxious	No
Syrian bean caper	*Zygophyllum fabago*	Noxious	No
Water hemlock	*Cicuta maculate*	Noxious	No
Water hyacinth	*Eichhornia crassipes*	Invasive	No
Water lettuce	*Pistia stratiotes*	Invasive	No
Western waterhemlock	*Cicuta douglasii*	Invasive	No
White horse nettle	*Solanum elaeagnifolium*	Noxious	No
Yellow foxtail	*Setaria glauca*	Invasive	No
Yellow starthistle	*Centaurea solstitialis*	Noxious	No
Yellow toadflax	*Linaria vulgaris*	Noxious	No

Sources: BLM 2004b; Eureka County Department of Natural Resources 1997; State of Nevada 2003.

[1] Based on surveys conducted by WESTEC (1995***b***) and JBR (2004b).
[2] A *Brassica* spp. was recorded during JBR's 2004 survey.



Ruby Hill Mine Expansion

Figure 3.9-1

Invasive and Non-native Species

02/02/05

vicinity and has been effectively controlled by hand pulling. Although spotted knapweed, cheatgrass, and hoary cress were observed during the 1995 vegetation baseline survey, spotted knapweed and hoary cress were not observed during the 2004 field survey (JBR 2004b).

Three invasive species were observed in the project area in 2004, including cheatgrass, halogeton, and a mustard (*Brassica* spp.). Localized populations of cheatgrass were observed in openings within sagebrush and piñon-juniper woodland communities and along roadsides, as well as in several previously disturbed soil borrow pit areas (**Figure 3.9-1**).

Halogeton only was observed within previously disturbed areas, either in or along roads or in soil borrow pit areas (**Figure 3.9-1**). This species commonly occurs in locations with unconsolidated soils and low soil moisture. The majority of the soil borrow pit areas have very fine silty soils, which provide good conditions for the establishment of this species. Currently, halogeton and Russian thistle are the dominant species in the existing soil borrow pit area. The mustard observed in the project area occurred in localized populations on roadsides and other disturbed areas within existing disturbance areas (JBR 2004b).

3.9.2 Environmental Consequences

3.9.2.1 Proposed Action

As stated in Section 3.9.1, Affected Environment, one noxious weed species (musk thistle) was observed in the project vicinity, and three invasive species (cheatgrass, halogeton, and a mustard [*Brassica* sp.]) were observed in the project area during a weed survey conducted by JBR in 2004. Noxious and invasive species readily invade areas that have been subject to surface disturbances, which typically lack or have minimal vegetative cover. Development and operation of the proposed mine expansion would remove or disturb approximately 744 acres of vegetation, of which 100 acres associated with the pit expansion would not be reclaimed. Growth media stockpiles would be reclaimed with an interim seed mix to stabilize the growth media, reduce soil erosion, and minimize the potential for the establishment of noxious or invasive species. In addition, the design and construction of the proposed mine expansion would facilitate concurrent reclamation during project operations and closure. Successful reclamation of these areas would result in the establishment of permanent vegetative cover, which would minimize the potential establishment of noxious and invasive species in the long term. As described in Section 2.3.14, Applicant-committed Environmental Protection Measures, certified weed-free mulch and seed mixes would be used for reclamation within the project area. If noxious weeds become established in project-related disturbance areas, a weed removal or spraying program would be implemented. As described in Section 2.3.15.6, Weed Control, weed control practices would be implemented during vegetation establishment to limit the growth and spread of noxious weeds and ensure that revegetation is successful with the proposed seed mixtures. Weed control practices would be implemented in coordination with the BLM, NDEP, and Diamond Valley Weed District to limit the spread of noxious weeds in the project area.

3.9.2.2 No Action Alternative

Under the No Action Alternative, the proposed mine expansion would not be developed, and associated potential noxious weed impacts would not occur. Under this alternative, ongoing mineral processing and reclamation would continue; however, there would be no additional ground-disturbing activities. Therefore, the potential for the establishment of noxious and invasive species would be minimized and restricted to previously disturbed areas. Existing weed control measures would continue to be implemented to prevent the establishment of new populations and to control existing populations.

3.9.3 Cumulative Impacts

The cumulative impact area for invasive and non-native species is shown in **Figure 3.5-2** and encompasses an area of 16,502 acres. The cumulative impact area for noxious and invasive species and the acres of vegetation that have been affected by past and present actions would be the same as described for vegetation (see Section 3.6.3, Cumulative Impacts). It is assumed that the majority of the total disturbance would be reclaimed, which would minimize the establishment of noxious or invasive species. Areas that would not be reclaimed would be prone to the establishment of noxious and invasive species.

3.9.4 Mitigation and Monitoring

Mitigation and monitoring would not be needed since weed control practices would be implemented to minimize the potential for noxious and invasive species establishment.

3.9.5 Residual Adverse Impacts

Residual impacts associated with noxious and invasive species would include the long-term loss of approximately 100 acres of vegetation associated with the pit expansion, which would not be reclaimed. However, noxious and invasive species would not likely become established in the pit due to the absence of soil and the formation of a pit lake in the long term. Implementation of weed control measures would minimize the potential for the establishment of noxious and invasive species in areas that would be reclaimed.

3.10 Wildlife Resources

The wildlife resources study area for direct and indirect impacts is the existing Ruby Hill Mine study area, which includes the proposed mine expansion areas. The cumulative impact area includes an expanded area surrounding the existing Ruby Hill Mine permit boundary (i.e., big game Management Area 14, Units 141 through 145).

3.10.1 Affected Environment

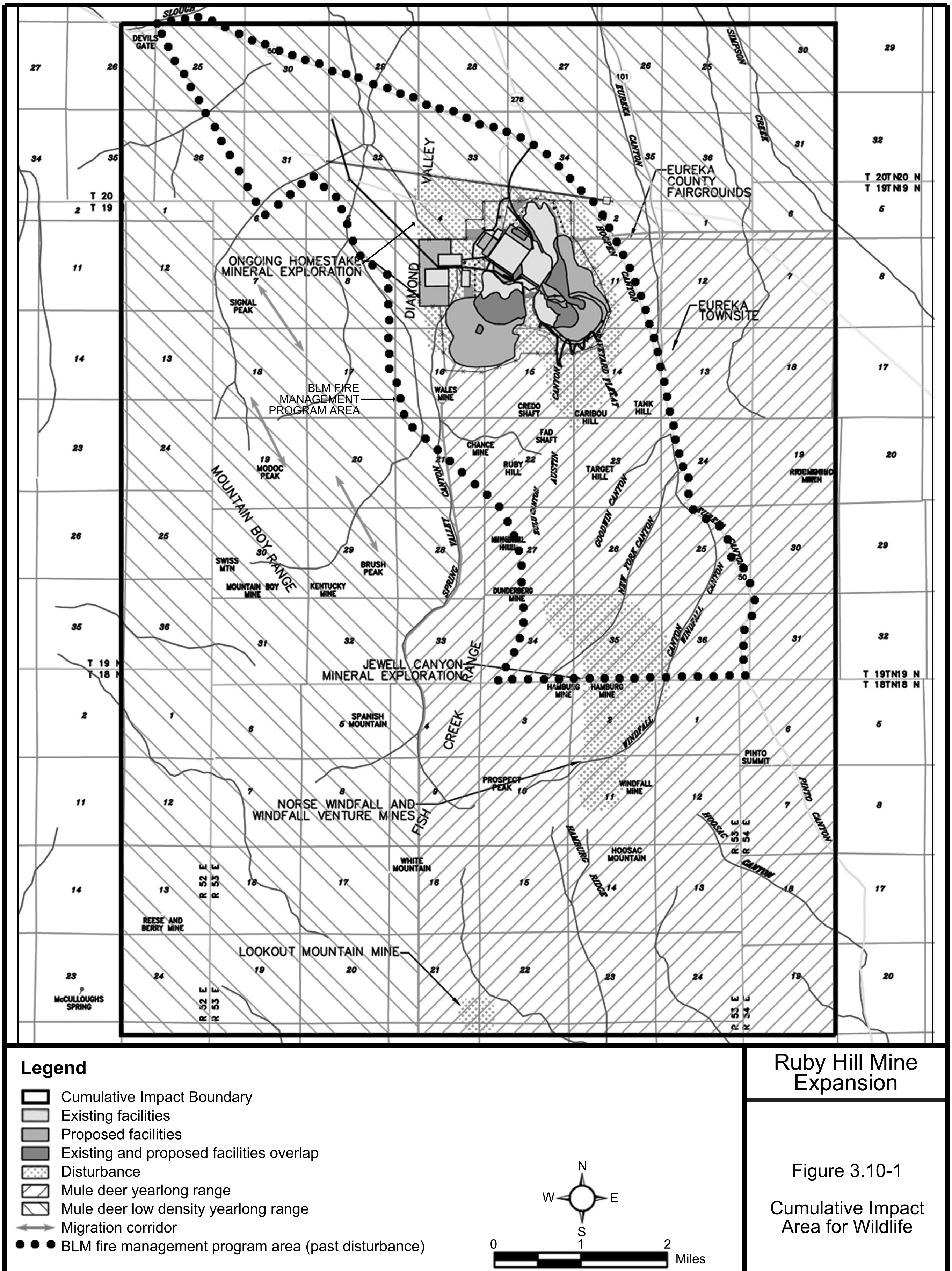
As discussed in Section 3.6, Vegetation Resources, the project area occurs within the transitional zone between piñon-juniper woodlands along the foothills of the Diamond Mountains and the lower elevation sagebrush scrub located in Diamond Valley. A total of six vegetation or habitat types were delineated for the project area (WESTEC 1994). These six habitat types, combining a number of plant communities, include: juniper woodland/black sagebrush, Wyoming big sagebrush/grassland, juniper woodland/Wyoming big sagebrush, Basin big sagebrush/Great Basin wildrye, winterfat/grassland, and altered grazing land type. Juniper woodland/black sagebrush is the most common vegetation community within the project area. A variety of terrestrial wildlife species are associated with all of these upland communities, with greater species diversity occurring in areas exhibiting greater vegetative structure and soil moisture, such as the Basin big sagebrush/Great Basin wildrye community found along the intermittent drainages that bisect the project area.

Available water for wildlife consumption is limited in the project region. Water sources in the vicinity of the project, particularly those that maintain open water and a multi-story canopy, support a greater diversity and population density of wildlife species than any other habitat types occurring in the region. Currently, no open water areas or riparian habitat occur in the immediate project area.

Information regarding wildlife species and habitat within the project area and cumulative impact area was obtained from a review of existing published sources, BLM and NDOW file information, NNHP database information, and site-specific field surveys within the mine expansion area (Brown 2003, 2004a,b; JBR 2001, 2004c,d; WESTEC 1995b, 1997a).

3.10.1.1 Game Species

Mule deer are the primary big game species in the project region. Population numbers within Management Area 14 (Units 141 through 145) for Eureka County are relatively stable, with slight population increases since 2000 (NDOW 2003). Below average habitat conditions in the project area are attributed to prolonged drought in the region. Water availability is the primary limiting factor in the study area. Other factors include the quantity and quality of available summer range (Podborny 2004). Water availability, forage quality, cover, and weather patterns typically determine the level of use and movement of deer through an area. Although deer occur throughout the project area, the lack of open or free water near the project site limits deer numbers. **Figure 3.10-1** presents the designated mule deer ranges and migration corridor located in the project area and cumulative impact area. Mule deer year-long range extends south and east from Mineral Point. Low-density year-long range encompasses the remainder of the area. The project site is located in mule deer year-long range and low-density year-long range (Podborny 1996; Lamp 2004).



Ruby Hill Mine Expansion

Figure 3.10-1

Cumulative Impact Area for Wildlife

01/09/05

The mule deer year-long range is part of the Diamond Mountains/Fish Creek Range herd area. This designated range includes deer fawning areas, summer range, and winter range. Summer use depends on water availability relative to forage and cover. Although deer fawning occurs throughout, no specific fawning sites have been documented for the project area or the cumulative impact area. Winter use in the project vicinity fluctuates with winter weather. In severe winters, deer would move out of the project area and surrounding vicinity into ranges that can support more animals under harsh conditions. Mule deer sporadically occupy the low-density year-long range, concentrating in the area during drought periods to take advantage of the alfalfa fields and residential areas that may provide additional forage and water (Podborny 1996). A prominent mule deer migration corridor is located west of the project area.

The mountain lion also is classified as a big game species. Mountain lions typically occupy the higher elevations surrounding the project area but move down into the lower elevations following the resident mule deer populations. This species would infrequently visit the project area (Podborny 1995).

The pygmy rabbit is a game species that has been documented in the project area. Although the pygmy rabbit is considered a game species in Nevada, it also is a BLM sensitive species and is discussed in detail in Section 3.10.1.5, Special Status Species. Other small game mammal species that could occur within the project area include cottontail rabbit and black-tailed rabbit (Lamp 2004).

Furbearers that may occur in the project area and cumulative impact area include the bobcat, gray fox, coyote, badger, long-tailed weasel, short-tailed weasel, spotted skunk, and striped skunk (Podborny 1996; Lamp 2004).

Upland game birds may occupy portions of the project area, although habitat is limited. Characteristic species for the project area would include sage grouse, chukar, California quail, and mourning dove. Chukar, California quail, and mourning dove all would occur within the proposed mine expansion area, but California quail are considered infrequent, and no known nest sites have been identified for these species (Podborny 1996). The western sage grouse is a BLM sensitive species and is discussed in detail in Section 3.10.1.5, Special Status Species.

Due to the lack of appropriate habitat, no waterfowl or shorebird concentrations are likely in either the project area or in the cumulative impact area. However, individuals may use isolated farm ponds and open water areas throughout Diamond Valley and the surrounding areas.

3.10.1.2 Nongame Species

A diversity of nongame species (e.g., small mammals, passerines, raptors, amphibians, and reptiles) occupy a variety of trophic levels and habitat types within the project area. Nongame mammals would include the least chipmunk, golden-mantled ground squirrel, Belding's ground squirrel, Townsend's ground squirrel, and pocket gopher (Podborny 1996). Rodent populations within the project area provide a substantial prey base for the areas predators including mammal (bobcat, gray fox, coyote, badger, skunk), raptor (eagles, buteos, accipiters, owls), and reptile species.

Nongame birds encompass a variety of passerine and raptor species including migratory bird species that are protected under the Migratory Bird Treaty Act (16 U.S. Code 703-711) and Executive Order (EO) 13186 (66 Federal Register 3853); see Section 3.10.1.3, Migratory Birds.

Several raptor species have been documented within the vicinity of the project include golden eagle, prairie falcon, American kestrel, ferruginous hawk, red-tailed hawk, Swainson's hawk, great-horned owl, and flammulated owl (Lamp 2004; JBR 2001, 2004d). The bald eagle and rough-legged hawk also winter in the Diamond Valley area (Podborny 1996). Details on sensitive raptor species such as golden eagle, ferruginous hawk, Swainson's hawk, prairie falcon, and burrowing owl are discussed further in Section 3.10.1.5, Special Status Species. Data on other raptors are presented below.

One active red-tailed hawk nest was recorded in 1995 approximately 1.5 miles from the project area. Historically, two additional red-tailed hawk nests or occupied territories were documented immediately adjacent and within 0.5 mile of the project area (Lamp 1996). The observed presence and behavior of two red-tailed hawks during the 1995 surveys inferred an additional occupied territory and possible nest site. These observations were recorded in the project area, indicating that a nest site could occur within the proposed disturbance areas. None of the documented red-tailed hawk nests occur within the proposed expansion area. However, a pair of red-tailed hawks was observed in the vicinity of one of six artificial nest structures that were constructed as mitigation for ferruginous hawks for the original Ruby Hill Project EIS. Although this pair of hawks was observed for 2 days in the area, no nesting attempt was documented on this nest structure.

An inactive nest that likely had been occupied by great-horned owls was recorded in a juniper tree within the project area. However, no sign of bird use was observed during the 1995 surveys. The specific locations of these historic and active nest sites have not been disclosed in this SEIS to ensure the protection of the nests and the breeding birds associated with these sites.

Other important nongame species include several bat species. Existing shafts, adits, and other underground openings support both breeding and hibernating bat species. These underground openings also may provide habitat for a variety of reptile, amphibian, bird, and invertebrate species. Summer bat surveys were conducted annually from 1995 to 2003 between the months of June and September to record any sign of bat use and presence (Brown 1996, 2003). Biannual winter surveys also were conducted in January 1996, 1998, 2000, 2002, and 2004 (Brown 2004a). Survey emphasis was placed on documenting nursery colonies and hibernacula and determining the potential presence of the Townsend's big-eared bat (*Corynorhinus townsendii*) and any of the myotis species (*Myotis* spp.). Bats that potentially occur in the vicinity of the project are listed in **Table 3.10-1**. Since many of the bats identified for this project are currently BLM sensitive species, the survey methods, area examined, and results are presented in detail in Section 3.10.1.5, Special Status Species.

Other nongame species in the project area would include common reptiles such as the western fence lizard, Great Basin skink, desert horned lizard, Great Basin rattlesnake, and sagebrush lizard. Amphibian presence would be limited in the project area, due to the lack of water sources. However, amphibians occur throughout the project region, according to habitat associations.

Table 3.10-1
Bat Species Potentially Occurring in the Project Vicinity

Common Name	Scientific Name	Status[1]
Townsend's big-eared bat[2,3]	*Corynorhinus townsendii*	BLM
Small-footed myotis[2,3]	*Myotis ciliolabrum*	BLM
Long-legged myotis[2]	*Myotis volans*	BLM
Long-eared myotis California myotis[2]	*Myotis evotis* *Myotis californicus*	BLM NA
Fringed myotis	*Myotis thysanodes*	BLM
Silver-haired bat	*Lasionycteris noctivagans*	BLM
Yuma myotis	*Myotis yumanensis*	NA
California myotis	*Myotis californicus*	NA
Little brown bat[2]	*Myotis lucifugus*	NA
Western pipistrelle	*Pipistrellus hesperus*	BLM
Big brown bat[2]	*Eptesicus fuscus*	BLM
Pallid bat	*Antrozous pallidus*	BLM

[1]BLM = BLM sensitive species
NA = not applicable
[2]Species found during the summer surveys, 1995 through 2003 (Brown 1996, 2003).
[3]Species found during winter surveys, 1996 through 2004 (Brown 2004***a***).

3.10.1.3 Migratory Birds

Pursuant to EO 13186, a draft Memorandum of Understanding among the BLM, U.S. Forest Service, and USFWS was drafted in order to promote conservation and protection of migrating birds. Specific measures to protect migratory bird species and their habitats have not been identified within EO 13186, but instead, the EO provides guidance to agencies to promote best management practices for the conservation of migratory birds. As a result, the BLM Nevada State Office prepared Migratory Bird Best Management Practices for the Sagebrush Biome in order to assist BLM field offices in the consideration of migratory birds in land management activities (BLM [no date]).

Breeding bird surveys were conducted June 5 to 9, 1995, within the project area. A total of 37 avian species were observed and recorded and are presented in **Table 3.10-2**. As shown, a number of these species are associated with a variety of habitat types, and many occur within the project area and project vicinity year-round. Details on sensitive bird species such as western greater sage-grouse, pinyon jay, loggerhead shrike, vesper sparrow, and juniper titmouse are discussed further in Section 3.10.1.5, Special Status Species.

3.10.1.4 Fisheries

No fisheries resources occur within the project area, due to the lack of suitable habitat (perennial water sources).

Table 3.10-2
Inventory of Breeding Bird Species Within the Project Area

Common Name	Scientific Name	Habitat Type[1]	Relative Abundance[2]
Turkey vulture	*Cathartes aura*	JW/WBS, WBS/G, AGLT[3]	L
Northern harrier[4]	*Circus cyaneus*	JW/BS, WBS/G	L
Red-tailed hawk[4]	*Buteo jamaicensis*	LS/G, MMS, JW/WBS, WBS/G, AGLT[3]	L
Ferruginous hawk[4]	*Buteo regalis*	JW/WBS, WBS/G, AGLT	M
American kestrel[4]	*Falco sparverius*	JW/BS, JW/WBS, WBS/G	M
Prairie falcon[4]	*Falco mexicanus*	LS/G, MMS, JW/BS, WBS/G, AGLT[3]	L
California quail[4]	*Callipepla californica*	AGLT[3]	L
Common nighthawk[4]	*Chordeiles minor*	JW/BS, AGLT[3]	H
Northern flicker[4]	*Colaptes auratus*	JW/WBS	M
Western kingbird	*Tyrannus verticalis*	AGLT[3]	L
Gray flycatcher	*Empidonax wrightii*	MMS, BBS/GBW, PPJW/MM, JW/BS, JW/WBS, WBS/G, AGLT[3]	H
Mourning dove	*Zenaida macroura*	JW/BS	L
Horned lark[4]	*Eremophila alpestris*	WBS/G, W/G, AGLT[3]	H
Scrub jay[4]	*Aphelocoma coerulescens*	MMS, JW/BS	M
Pinyon jay[4]	*Gymnorhinus cyanocephalus*	JW/BS, JW/WBS, WBS/G	M
Common raven[4]	*Corvus corax*	LS/G, MMS, PPJW/MM, JW/BS, JW/WBS, WBS/G	M
Mountain chickadee[4]	*Parus gambeli*	MMS, PPJW/MM, JW/BS	M
Rock wren	*Salpinctes obsoletus*	LS/G, PPJW/MM	L
Blue-gray gnatcatcher	*Polioptila caerulea*	MMS, JW/WBS, WBS/G	M
Mountain bluebird	*Sialia currucoides*	PPJW/MM, WBS/G, AGLT[3]	M
Loggerhead shrike[4]	*Lanius ludovicianus*	JW/BS, JW/WBS	L
Sage thrasher	*Oreoscoptes montanus*	WBS/G, AGLT[3]	H
Solitary vireo	*Vireo solitarius*	PPJW/MM	L
Yellow-rumped warbler	*Dendroica coronata*	PPJW/MM, JW/WBS	M
Black-throated gray warbler	*Dendroica nignescens*	PPJW/MM, JW/BS	M
Black-headed grosbeak	*Pheuticus melanocephalus*	MMS, JW/BS	L
Green-tailed towhee	*Pipilo chlorurus*	MMS, PPJW/MM	H
Rufous-sided towhee[4]	*Pipilo erythrophthalmus*	MMS, PPJW/MM, JW/BS	M
Vesper sparrow	*Pooecetes gramineus*	MMS, WBS/G, AGLT	M
Lark sparrow	*Chondestes grammacus*	AGLT[3]	H
Sage sparrow	*Amphispiza belli*	WBS/G, AGLT	M
Chipping sparrow	*Spizella passerina*	PPJW/MM	M
Brewer's sparrow	*Spizella breweri*	MMS, JW/BS, JW/WBS, WBS/G, W/G	H
Western meadowlark[4]	*Sturnella neglecta*	AGLT[3]	M
Brown-headed cowbird	*Molothrus ater*	MMS, PPJW/MM, AGLT[3]	L
Western tanager	*Piranga ludoviciana*	JW/WBS	L
Cassin's finch[4]	*Carpodacus cassinii*	PPJW/MM	L

[1] LS/G = low sagebrush/grassland
MMS = mixed mountain shrub
BBS/GBW = Basin big sagebrush/Great Basin wildrye
PPJW/MM = piñon pine and juniper woodland/mountain mahogany
JW/BS = juniper woodland/black sagebrush
JW/WBS = juniper woodland/Wyoming big sagebrush
WBS/G = Wyoming big sagebrush/grassland
W/G = winterfat/grassland
AGLT = altered grazing land type
[2]Relative incidence of individuals within identified habitats (L = Low; M = Moderate; H = High).
[3]AGLT = altered grazing land type including cultivated land.
[4]Species that occur in the project area or project vicinity year-round.

Source: BLM 1997a.

3.10.1.5 Special Status Species

Special status species are those species for which state and federal agencies afford an additional level of protection by law, regulation, or policy. Included in this category are federally listed and federally proposed species that are protected under the ESA, or are considered candidates for such listing by the USFWS, and BLM sensitive species.

In accordance with the ESA, as amended, the lead agency (BLM) in coordination with the USFWS must ensure that any action that they authorize, fund, or carry out would not adversely affect a federally listed threatened or endangered species. In addition, as stated in Special Status Species Management Policy 6840 (6840 Policy) (Rel. 6-121), it also is BLM policy "to conserve listed species and the ecosystems on which they depend, and to ensure that actions requiring authorization or approval by the BLM are consistent with the conservation needs of special status species and do not contribute to the need to list any special status species, either under the provisions of the ESA or other provisions" identified in 6840 Policy. The BLM has been under informal consultation with the USFWS, as outlined by Section 7 of the ESA. The following discussion summarizes known data for the sensitive wildlife species identified for the Proposed Action by the applicable agencies.

A total of 47 terrestrial and aquatic special status species (42 terrestrial species and 5 aquatic species) were identified as potentially occurring within the study area (BLM 2004***a***; NNHP 2004; USFWS 2004). These species, their associated habitats, and their potential for occurrence within the study area are summarized in **Table 3.10-3**. Occurrence potential in the study area and cumulative impact area was evaluated for each species based on their habitat requirements and/or known distribution. Based on these evaluations, 27 special status species were eliminated from detailed analysis. The remaining 20 species are designated BLM sensitive species. These include golden eagle, ferruginous hawk, Swainson's hawk, prairie falcon, western sage grouse, western burrowing owl, pinyon jay, loggerhead shrike, vesper sparrow, juniper titmouse, pallid bat, big brown bat, Townsend's big-eared bat, silver-haired bat, small-footed myotis, long-eared myotis, fringed myotis, long-legged myotis, western pipistrella, and pygmy rabbit. No federally listed, federally proposed, or federal candidate species would be impacted by the Proposed Action.

Birds

Golden Eagle. The golden eagle is a yearlong resident and is considered to be a common breeder throughout Nevada; however, eagle densities and nesting activity are greatest in the northern third of the state (Herron et al. 1985). Nesting golden eagles prefer suitable cliffs that overlook sagebrush flats, piñon-juniper woodlands, salt desert scrub, or other habitats that are capable of supporting a suitable prey base. Highest densities of nesting eagles typically are found along river systems where cliffs border the entire length of the river, while lower nesting densities are found in pinyon-juniper habitat and salt desert shrub communities (Herron et al. 1985). Wintering golden eagles tend to congregate in broad valleys interspersed with agricultural crop lands or sagebrush and desert shrub communities. Although this species has been documented in the project vicinity, suitable nesting habitat in the immediate project area is limiting. No active eagle nests have been recorded within or near the proposed mine expansion area.

Table 3.10-3
Special Status Species Identified for the Ruby Hill Mine Expansion-East Archimedes Project

Common Name/ Scientific Name	Status[1]	Range Habitat Requirements	Potential for Occurrence on or Near the Project Area	Eliminated From Detailed Analysis
BIRDS				
Western least bittern *Ixobrychus exilis hesperis*	BLM	Range: Throughout Nevada, as a rare migrant and breeding species. Habitat: Requires dense emergent vegetation within wetlands and marshes. Nests over water in dense emergent vegetation.	None.	Yes. No potentially suitable nesting habitat occurs within or near the project area.
Northern goshawk *Accipiter gentilis*	BLM	Range: Throughout Nevada. Habitat: Generally occupies montane forests in spring and summer, with some altitudinal migration into foothills and valleys in the winter. Montane and foothill aspen groves are the species' preferred nesting sites in Nevada, generally near perennial streams.	None.	Yes. No suitable habitat occurs within or near the project area. One historic nest/territory is located approximately 2.5 miles east of the project area.
Golden eagle *Aquila chrysaetos*	BLM	Range: Throughout Nevada and the West. Habitat: Occupies a variety of habitats. Nest on cliffs or rock outcrops, less commonly in trees, usually in isolated undisturbed areas.	Low. No nest sites for this species have been documented within or near the project area. However, this species is likely to forage within the project vicinity.	No.
Ferruginous hawk *Buteo regalis*	BLM	Range: Primarily in eastern and central Nevada. Habitat: Edge of piñon-juniper habitat at interface with low shrub grasslands.	High. The species is confirmed to nest within the vicinity of the mine expansion area, primarily in piñon-juniper interface overlooking Diamond Valley, on the west and south areas of the site. As part of mitigation for the original Ruby Hill Project, 6 artificial nest structures were constructed on the mine site, the majority of which have been utilized by nesting ferruginous hawks since 1996.	No.
Swainson's hawk *Buteo swainsonii*	BLM	Range: Throughout Nevada and the west. Habitat: Open habitats, including agricultural areas. Generally nests in trees overlooking these habitats, particularly in cottonwoods overlooking pasture and agricultural lands.	Low. The species has been observed on site in two consecutive years (2000 and 2001) during monitoring of artificial nest structures. Nesting by this species not noted during earlier baseline surveys in the project area. No suitable nest trees occur within the project vicinity.	No.
Bald eagle *Haliaeetus leucocephalus*	FT	Range: Throughout Nevada. Habitat: Nests in close association with water; winters where abundant food is available, generally feeding near large bodies of water with appropriate roosting trees nearby.	None.	Yes. The site does not occur near any large bodies of water that could provide suitable roosting, nesting, or foraging habitat. The closest known, historic bald eagle roost site occurs over 15 miles northeast of the project area along the western edge of Newark Valley. Occurrence by this species within the project vicinity would be limited to migrating and foraging individuals.

Table 3.10-3 (Continued)

Common Name/ Scientific Name	Status[1]	Range Habitat Requirements	Potential for Occurrence on or Near the Project Area	Eliminated From Detailed Analysis
Prairie falcon *Falco mexicanus*	BLM	Range: Throughout the Great Basin and the west. Habitat: Nests primarily on ledges and outcrops in steep cliff-faces.	Low. No suitable nesting habitat occurs within the project vicinity. The nearest recorded nest site occurs approximately 1.5 miles south of the project area. As a result, occurrence by this species within the project area would be limited to foraging individuals.	No.
Greater sage grouse *Centrocercus urophasianus*	BLM	Range: Throughout Nevada where sagebrush occurs. Habitat: The species occurs in healthy sagebrush habitats. Leks are located in open areas. Nesting is within sagebrush habitats near leks. Chicks are raised in moist meadows within sagebrush communities.	Low. The closest identified lek occurs approximately 1 mile west of the project area. Surveys of the lek during 1995 indicated that the lek was not active. Although sage grouse could potentially nest in the upland habitat associated with the project area, lack of water sources would limit the use by brooding birds.	No.
Mountain quail *Oreortyx pictus*	BLM	Range: Western Nevada and the Sierras and has been reported from the Toiyabe Range in central Nevada. Habitat: Frequents areas of dense vegetation on steep mountain slopes and dense shrub vegetation along mountain streams.	None.	Yes. No Potentially suitable nesting habitat occurs within or near the project area. The project area is likely outside of the species geographic and elevational range.
Snowy plover *Charadrius alexandrinus*	BLM	Range: Much of the Great Basin portion of Nevada. Habitat: The species selects barren salt pans or dry mudflats for nesting, usually at playas in the valley bottoms.	None.	Yes. No potentially suitable nesting habitat occurs within or near the project area.
Long-billed curlew *Numenius americanus*	BLM	Range: Throughout Nevada's Great Basin. Habitat: Open habitats, including grassy areas close to marshes and open dry areas including alkali lakes and playas.	None.	Yes. No potentially suitable nesting habitat occurs within or near the project area.
Yellow-billed cuckoo *Coccyzus americanus occidentalis*	FC	Range: Primarily the eastern U.S. with isolated occurrences in suitable habitat in the western states. Habitat: In the west, the yellow-billed cuckoo nests in dense and extensive riverine riparian habitat along larger streams and rivers, usually with extensive cottonwood groves.	None.	Yes. No suitable habitat occurs within or near the disturbance area, nor would habitat be affected by mine-related groundwater drawdown.
Short-eared owl *Asio flammeus*	BLM	Range: Common summer and sometimes winter resident throughout the Great Basin in Nevada. Habitat: Open grassland, especially near marshes. Requires low shrub cover for hunting over open grassland.	None.	Yes. No potentially suitable nesting habitat occurs within or near the project area.
Long-eared owl *Asio otis*	BLM	Range: The long-eared owl is widespread throughout Nevada. Habitat: The species nests and hunts within dense riparian habitat, often with a deciduous tree component.	None.	Yes. No potentially suitable nesting habitat occurs within or near the project area.

Table 3.10-3 (Continued)

Common Name/ Scientific Name	Status[1]	Range Habitat Requirements	Potential for Occurrence on or Near the Project Area	Eliminated From Detailed Analysis
Western burrowing owl *Athene cunicularia hypugaea*	BLM	Range: Throughout Nevada and the West. Habitat: The owls select open areas with low vegetation in grassland, shrubland, and agricultural areas. The owls often select cut banks or berms along roads and field and cut banks along washes. Nest sites include abandoned burrows of prairies dogs, ground squirrels, foxes, and badgers.	Low. Although no occupied burrows or owl sign was recorded during the 1995 surveys at the mine, the shrubland vegetation that would be disturbed is suitable for supporting breeding and foraging birds.	No.
Flammulated owl *Otus flammeolus*	BLM	Range: The Sierra Nevada, Utah, Arizona, New Mexico, Colorado, and isolated mountain ranges in the Nevada portion of the Great Basin. Habitat: Mature ponderosa and Jeffrey pine forest with large trees. Nests in snags of large dead trees.	None.	Yes. No potentially suitable nesting habitat occurs within or near the project area.
Lewis's woodpecker *Melanerpes lewis*	BLM	Range: Throughout the Great Basin and the West. Habitat: Requires areas of trees interspersed with open areas. Primary breeding habitat is open ponderosa and Jeffrey pine forests, but also occurs in logged or burned coniferous forests, and in open mountain mahogany, aspen and cottonwood groves. During 2003 Nevada bird counts, no occurrences were noted in piñon-juniper habitat.	None.	Yes. No potentially suitable nesting habitat occurs within or near the project area.
Red-naped sapsucker *Sphyrapicus nuchalis*	BLM	Range: A common permanent resident throughout the Great Basin in Nevada and elsewhere in the West. Habitat: Prefers deciduous trees, nesting in groves of aspen in the mountains and in cottonwoods along streams.	None.	Yes. No potentially suitable nesting habitat occurs within or near the project area.
Pinyon jay *Gymnorhinus cyanocephalus*	BLM	Range: A common and abundant year-round resident species throughout the Great Basin. Habitat: The species is closely associated with piñon-juniper habitats but also in association with other pines such as Jeffrey pine.	High. This species has been recorded during baseline studies in the mine area.	No.
Crissal thrasher *Toxostoma crissale*	BLM	Range: Southern Nevada, southern California, Southern Arizona Habitat: Joshua trees and catclaw mesquite chapparal.	None.	Yes. No potentially suitable nesting habitat occurs within or near the project area. Also, the project area is outside of the geographical range of this species.
LeConte's thrasher *Toxostoma lecontei*	BLM	Range: Southern Nevada, southern California, and southern Arizona. Habitat: Hottest and lowest deserts, often in open creosote and desert shrub habitats, occasionally catclaw mesquite chapparal.	None.	Yes. No potentially suitable nesting habitat occurs within or near the project area. Also, the project area is outside of the geographical range of this species.
Loggerhead shrike *Lanius ludovicianus*	BLM	Range: Throughout the west and U.S. Habitat: The shrike is a common, but not abundant, summer resident of the Great Basin. It frequents open county in the valleys and foothills of the Great Basin, using a variety of shrub and grassland habitats, perching conspicuously on shrubs and fences, and nesting in dense shrubs.	High. This species has been recorded during baseline studies in the mine area.	No.

Table 3.10-3 (Continued)

Common Name/ Scientific Name	Status[1]	Range Habitat Requirements	Potential for Occurrence on or Near the Project Area	Eliminated From Detailed Analysis
Gray vireo *Vireo vicinior*	BLM	Range: South and southeast central Nevada, southern Utah, and Arizona. Habitat: Dry brush slopes and piñon-juniper in mountain foothills.	None.	Yes. The project area is outside of the geographical range of this species.
Lucy's warbler *Vermivora luciae*	BLM	Range: Southern Nevada, southern California, southern Arizona, and southern Utah. Habitat: Riparian habitats along streams.	None.	Yes. No potentially suitable nesting habitat occurs within or near the project area. Also, the project area is outside of the geographical range of this species.
Vesper sparrow *Pooecetes gramineus*	BLM	Range: Throughout the Great Basin. Habitat: The vesper sparrow is a ground-nesting bird that frequents open ground habitat with low shrubs and sparse grass cover in low sagebrush grasslands.	Low. Suitable habitat for the species occurs within the project area. The species was recorded from sagebrush habitats, agricultural lands, and pasture land in Diamond Valley west of the mine area.	No.
Black rosy finch *Leucosticte atrata*	BLM	Range: Throughout the Great Basin and the west. Habitat: Breeding habitat is open meadows and tundra above tree-line in the western mountains.	None.	Yes. No potentially suitable nesting habitat occurs within or near the project area. Also, the project area is outside of the elevational range of this species.
Juniper titmouse *Baeolophus ridgwayi*	BLM	Range: Throughout the Great Basin. Habitat: A common year-round resident in piñon/juniper woodlands.	Low. Potentially suitable habitat occurs within the project area. Although this species was not recorded during baseline studies within the project area, it is a common species in piñon-juniper habitat throughout Nevada.	No.
Yellow-breasted chat *Icteria virens*	BLM	Range: Throughout the Great Basin and the west. Habitat: Nests and forages in dense riparian thickets in the valleys or along the foothills of mountain ranges.	None.	Yes. No potentially suitable nesting habitat occurs within or near the project area.
MAMMALS				
Pallid bat *Antrozous pallidus*	BLM	Range: Widespread throughout much of the west. Habitat: Arid deserts and grasslands, often near rocky outcrops and water. Less abundant in evergreen and mixed conifer woodland. Usually roosts in rock crevice or building, less often in caves, tree hollows, mines, etc.	Low. The genus has not been recorded at the site during bat surveys.	No.
Big brown bat *Eptesicus fuscus*	BLM	Range: Widespread throughout the U.S. Habitat: Various wooded and semi-open habitats, including cities. Summer roosts generally are in buildings; also hollow trees, rock crevices, tunnels, and cliff swallow nests. Maternity colonies form in attics, barns, tree cavities, rock crevices, caves.	Low. The species has been recorded using the Bullwhacker Mine complex. However, only one individual was documented in 2002.	No.

Table 3.10-3 (Continued)

Common Name/ Scientific Name	Status[1]	Range Habitat Requirements	Potential for Occurrence on or Near the Project Area	Eliminated From Detailed Analysis
Townsend's big-eared bat *Corynorhinus townsendii*	BLM	Range: Most of Nevada and the west. Habitat: Maternity and hibernation colonies typically are in caves and mine tunnels. Prefers relatively cold places for hibernation, often near entrances and in well-ventilated areas. Forages over a wide variety of habitats from coniferous forests to sagebrush to grasslands.	High. The species has been recorded from the Bullwhacker, Holly, Silver West, and Williamsburg mine complexes.	No.
Silver-haired bat *Lasionycteris noctivagans*	BLM	Range: Throughout much of the western U.S. Habitat: Primarily in forested areas, but does forage over meadows and in riparian zones along streams. Maternity roosts occur almost exclusively in trees. Hibernates in trees, rock crevices, buildings, mines, and caves.	Low. The genus has not been recorded at the site during bat surveys. The site lacks suitable forested habitat for the species.	No.
Small-footed myotis *Myotis ciliolabrum*	BLM	Range: Most of Nevada and the west. Habitat: Roosts in caves, tunnels, mines, buildings, and rock crevices. Primarily uses grassland and desert scrub habitats.	High. The species has been recorded from the Bullwhacker, Holly, Silver West, and Williamsburg mine complexes.	No.
Long-eared myotis *Myotis evotis*	BLM	Range: Widespread over the western U.S. Apparently occurs regularly in low numbers throughout the range. Habitat: Roosts in a wide variety of situations—caves, tunnels, and under tree bark. Primarily uses coniferous forest habitats, but does occur over shrublands.	Low. The species has not been recorded at the site, but previous bat surveys indicated several myotis not identified to species.	No.
Fringed myotis *Myotis thysanodes*	BLM	Range: Throughout Nevada and the west. Thought to normally occur in low numbers throughout range. Habitat: Roosts in a variety of habitats, caves, tunnels, mines, and trees. Uses a variety of habitats, forests, shrublands, and agricultural land.	Low. The species has not been recorded at the site, but previous bat surveys indicated several myotis not identified to species.	No.
Long-legged myotis *Myotis volans*	BLM	Range: Widespread distribution in western North America; considered locally abundant. Habitat: Primarily in montane coniferous forests, seasonally in riparian and desert habitats. Roosts in exfoliating tree bark, tree snags, and rock crevices. Hibernates in tunnels and mines.	Low. The species has been recorded using the Bullwhacker Mine complex. However, only one individual was documented in 1997.	No.
Western pipistrelle *Pipistrellus hesperus*	BLM	Range: Throughout the west. Habitat: Deserts and lowlands, desert mountain ranges, desert scrub flats, and rocky canyons. Day and night roosts include rock crevices, under rocks, burrows, and sometimes buildings or mines. May hibernate in caves, mines, or rock crevices. Typically visits water and drinks immediately after emergence each evening.	Low. The genus has not been recorded at the site during bat surveys. The site lacks suitable water sources for the species.	No.

Table 3.10-3 (Continued)

Common Name/ Scientific Name	Status[1]	Range Habitat Requirements	Potential for Occurrence on or Near the Project Area	Eliminated From Detailed Analysis
Pygmy rabbit *Brachylagus idahoensis*	BLM	Range: Throughout the range of sagebrush in the intermountain West. Habitat: Consists of dense Great Basin sagebrush with a dense understory and having soils suitable for burrowing. The rabbit's burrows are distinctive and typically are placed at the base of sagebrush.	High. Suitable habitat for the species occurs in areas of tall, dense sagebrush associated with ephemeral drainages at the site. This species has been documented within the mine area.	No.
FISH				
Lahontan cutthroat trout *Oncorhynchus henshawi*	FT	Range: Western Lahontan basin (Truckee, Carson, and Walker river basins), northwestern Lahontan basin (Quinn River, Black Rock Desert, and Coyote Lake basins), and the Humboldt River basin. Habitat: Rivers and streams in the above drainages.	None.	Yes. No aquatic habitat occurs within the disturbance area. The project area would not drain to any drainage in which the species occurs, nor are any of the drainages within the area that could be affected by mine-related groundwater drawdown.
Fish Creek Springs tui chub *Gila bicolor euchila*	BLM	Range: The tui chub species occur widely in a variety of aquatic habitats throughout Nevada, California, and Oregon. It occurs as distinctive forms (as many subspecies) in most isolated or partially isolated drainage systems in these three states. The subspecies populations are endemic to their isolated waters. The subspecies *euchila* is known from near Fish Springs in the Little Smoky Valley, and also may occur in Newark Valley, to the north of Little Smoky Valley. Habitat: Spring-fed small streams in the valleys identified above.	None.	Yes. No aquatic habitat occurs within the disturbance area. No aquatic habitat would be affected by mine-related groundwater drawdown. The valleys in which the subspecies occurs is located about 10 miles south and 10 miles east of Eureka. The Ruby Hill site drains to Diamond Valley, which is isolated from the Little Smoky and Newark Valleys.
Big Smoky Valley tui chub *Gila bicolor ssp.*	BLM	Range: This sub-species of the tui chub is known from the Big Smoky Valley, between the Toiyabe and Toquima mountain ranges in central Nevada. Habitat: Spring-fed small streams in the above valley.	None.	Yes. No aquatic habitat occurs within the disturbance area. The valley in which the subspecies occurs is 50 miles west of Eureka. The Ruby Hill site drains to Diamond Valley, which is not connected to the Big Smoky Valley.
Big Smoky Valley speckled dace *Rhinichthys osculus lariversi*	BLM	Range: The speckled dace species occur widely in a variety of aquatic habitats throughout the west, occurring in most major western drainages. It occurs as distinctive forms (as many subspecies) in most isolated or partially isolated drainage systems in the Great Basin. The subspecies populations generally are endemic to their isolated waters. The subspecies *lariversi* is known from the Big Smoky Valley, between the Toiyabe and Toquima mountain ranges in central Nevada. Habitat: Perennial streams in the above valley.	None.	Yes. No aquatic habitat occurs within the disturbance area. The valley in which the subspecies occurs is 50 miles west of Eureka. The Ruby Hill site drains to Diamond Valley, which is not connected to the Big Smoky Valley.

Table 3.10-3 (Continued)

Common Name/ Scientific Name	Status[1]	Range Habitat Requirements	Potential for Occurrence on or Near the Project Area	Eliminated From Detailed Analysis
AMPHIBIANS				
Spotted frog *Rana luteiventris*	FC	Range: Within Nevada, Upper, North Fork, and South Fork of the Humboldt River, Reese River, Pine Creek (in northern Eureka County), Rock Creek (in Elko County), and southern Big Smoky Valley. Habitat: Aquatic habitats, ponds, and sloughs in the above drainages.	None.	Yes. No suitable habitat occurs within or near the disturbance area, nor would habitat be affected by mine-related groundwater drawdown.
INVERTEBRATES				
Elongate Cain Spring pyrg *Pyrgulopsis augusta*	BLM	Range: Reese River Valley on the west side of the Toiyabe Range in central Nevada. Habitat: This freshwater snail occurs in spring pools in the Reese River Valley.	None.	Yes. No aquatic habitat occurs within the disturbance area. The valley in which the subspecies occurs is over 50 miles west of Eureka. The Ruby Hill site drains to Diamond Valley, which is not connected to the Reese River Valley.
Large-gland carico pyrg *Pyrgulopsis basiglans*	BLM	Range: Middle Humboldt River Valley, northern Lander County, Nevada. Habitat: This freshwater snail occurs in aquatic habitats within the above drainage.	None.	Yes. No aquatic habitat occurs within the disturbance area. The project area is likely outside of the species geographic range. The mine site does not drain to the Humboldt.
Ovate Cain Spring pyrg *Pyrgulopsis pictilis*	BLM	Range: Reese River Valley on the west side of the Toiyabe Range in central Nevada. Habitat: This freshwater snail occurs in spring pools in the Reese River Valley.	None.	Yes. No aquatic habitat occurs within the disturbance area. The valley in which the subspecies occurs is over 50 miles west of Eureka. The Ruby Hill site drains to Diamond Valley, which is not connected to the Reese River Valley.
Big Smoky wood nymph *Cercyonis oetus alkalorum*	BLM	Range: Known only from the Big Smoky Valley, between the Toiyabe and Toquima ranges in central Nevada. Habitat: Grassy alkaline flats.	None.	Yes. The mine area is over 50 miles east of the species' range. Also, suitable habitat does not occur on the site.

[1]Status:
FT - Federally threatened species.
FC - Federal candidate species.
BLM - BLM sensitive species

Source: JBR 2004c.

Ferruginous Hawk. The ferruginous hawk is a common breeder in this area of Nevada. This species typically nests on trees, promontory points, rocky outcrops, cut banks, or on the ground (Terres 1991). Preferred breeding habitat is scattered juniper trees at the interface between piñon-juniper and desert shrub communities that overlook broad valleys (Herron et al. 1985). This habitat is represented along the southern portion of Diamond Valley in the project area. The ferruginous hawk's primary prey species in this area of Nevada include ground squirrels, particularly the Townsend's ground squirrel, and black-tailed jackrabbits. Nestlings generally fledge by early to mid-July, as the ground squirrels enter aestivation, and breeding birds typically move out of the area by August.

A total of 16 historic nests or ferruginous hawk territories have been documented within 2 miles of the project area (Lamp 1996; WESTEC 1994), with all but 4 of these nests located within the cumulative impact area. These nests occur in the transitional zone between the piñon-juniper uplands and the valley shrublands. In 1995, field surveys documented 10 nest sites (five active and five inactive) near the Ruby Hill Mine area. Four of the five active nests were located in close proximity to inactive nests, suggesting alternate nest sites within five ferruginous hawk territories.

Based on the 1995 survey results, six (three active and three inactive) ferruginous hawk nests were documented within 0.25-mile of the disturbance area associated with the existing Ruby Hill Project. As a result, it was determined during permitting that significant adverse effects to the ferruginous hawk would occur from the implementation of the Ruby Hill Project. Consequently, six artificial nest structures were constructed in 1996 to mitigate potential effects to breeding ferruginous hawks from construction and operation of the project (BLM 1997a). Between 1997 and 2004, four of the six artificial nest structures have been occupied for at least 1 year and a maximum of 3 years. The greatest reproduction at these nest structures was documented from 1997 to 2000, where 8 nest attempts resulted in 22 nestlings (2.75 nestlings per nest attempt) (JBR 2004c). Between 2001 and 2004, only 3 nest attempts resulted in 6 nestlings (2 nestlings per nest attempt). A reduction in reproduction over the past 4 years is perhaps the result of low prey base densities that have been observed within the project area (JBR 2004c).

Swainson's Hawk. The Swainson's hawk is a summer resident of Nevada and, like the golden eagle, is most abundant in the northern third of the state (Herron et al. 1985). The majority of documented breeding territories in Nevada have been located in agricultural valleys. Swainson's hawks nest in a wide variety of vegetative communities from 4,000 to 6,500 feet in elevation. Nest sites primarily are found in deciduous trees; however, nests also have been documented in other vegetation types such as buffaloberry, serviceberry, and sagebrush (Herron et al. 1985). No nest sites have been documented for this species within the project area. As a result, occurrence by this species within the project area would be limited to migrating and foraging individuals. However, a Swainson's hawk was observed perching on an artificial nest structure in 2000 and 2001 within the mine area (JBR 2004c).

Prairie Falcon. The prairie falcon is a year-round resident to Nevada. The breeding distribution of this species generally is restricted to geographic areas containing cliffs and escarpments adjacent to broad, semi-arid valleys. The highest nesting densities in Nevada occur in northern counties, particularly located in or near the mouth of narrow canyons, overlooking riparian vegetation and agricultural lands (Herron et al. 1985). Relative to the project area, a prairie falcon eyrie occurs 1.5 miles south of the project area. This nest site was occupied and reportedly active in 1994, but not in 1995. Additional prairie falcon activity was observed in the vicinity of the project, encompassing Caribou Hill and agricultural fields to the northwest of the project area (WESTEC 1994). NDOW also documented a historical prairie falcon eyrie northwest of the study area (Lamp 1996).

Greater Sage Grouse. The greater sage grouse ***was*** petitioned to be federally listed as a result of the downward trend of local populations and the reduction of habitat (Sage Grouse Conservation Planning Team 2001; Kritz 2004). ***However, in 2005, the USFWS determined that the petition action for this species was not warranted.*** Sage grouse generally occupy upland shrub communities, breeding on open leks (or strutting grounds) and nesting and brooding in upland areas and meadows in proximity to water. Relative to the project area, one historic sage grouse lek has been documented approximately 1 mile west of the project area within southern Diamond Valley (Podborny 1996; Lamp 2004). The lek was active in 1989, 1990, 1991, and 1992. However, no recent sign of use has been recorded at this lek by NDOW (Podborny 2004). Sage grouse could nest in the upland habitat of the project area, but the lack of water sources and activity at nearby lek sites would limit the use by brooding birds in the project area.

Western Burrowing Owl. The burrowing owl is an uncommon summer resident that breeds in portions of Nevada. It is dependent on abandoned mammal burrows for nesting, typically foraging in open grasslands and sagebrush habitats. This owl feeds on insects and small rodents, with some reptiles, amphibians, and small birds taken (Terres 1991). The burrowing owl is known to nest in the project vicinity. One active nest has been documented approximately 6 miles northeast of the project area (Lamp 1996), and additional owl observations have been reported northwest and north of the project area. Suitable habitat (i.e., sagebrush/grassland communities and agricultural lands) located within the project area was surveyed during the 1995 field studies. No burrowing owls or associated sign were observed during these surveys. A number of mammal burrows were located within suitable habitat, but no burrows exhibited sign of recent owl occupation.

Pinyon Jay. The pinyon jay is a year-round resident that is sporadically distributed throughout the piñon-juniper belt extending from the Humboldt River south into the mountain ranges of the Mojave Desert, and from the Sierra Nevada Range to the Utah border. Although the pinyon jay is known to utilize yellow pine forests in other states, no other bird species in Nevada is more strongly tied to a single habitat type than this species. Pinyon jays are the primary seed disseminator for the pine, while the pine provides the jay's primary food source, pinyon nuts (Nevada Partners in Flight [NPIF] 1999). Other food sources include berries, small seeds, grains, and insects. Pinyon jays often occur in loose flocks that consist of multiple breeding pairs and the offspring of those pairs from previous nesting seasons. Nests are located in conifer trees, 8 to 20 feet off the ground (Ehrlich et al. 1988; Haywood et al. 1976; Marshall et al. 2003). This species has been documented as occurring within the project area (JBR 2004c; WESTEC 1995b).

Vesper Sparrow. The vesper sparrow is a summer resident that occurs in various open shrub habitats from high elevation valleys to higher mountain slopes and basins. This species occurs from approximately 5,500 feet in elevation in the foothills of northern Nevada to approximately 9,000 feet in elevation in surrounding mountain ranges. Open areas with a scattered canopy of big sagebrush and a minimum ground cover of 20 percent grasses, forbs, and young shrubs appear to be the preferred nesting habitat for this species. Nests normally are placed on the ground under or near shrubs. Diets consist of seeds and insects (NPIF 1999). This species has been documented as occurring within the project area (JBR 2004c; WESTEC 1995b).

Juniper Titmouse. The juniper titmouse is a year-round resident that is strongly associated with piñon-juniper woodlands. This species occurs along the piñon-juniper belt through Nevada, ranging from 4,500 to 7,500 feet in elevation. Dense foliage and closed canopies are preferred, while thin understory and ground cover are preferred for some feeding activities. This species often nests in cavities in riparian vegetation juxtaposed to piñon-juniper. As a result, the juniper titmouse tend to frequent the interface between piñon-juniper and riparian habitats. This species has been documented as occurring within the project area (JBR 2004c; WESTEC 1995b).

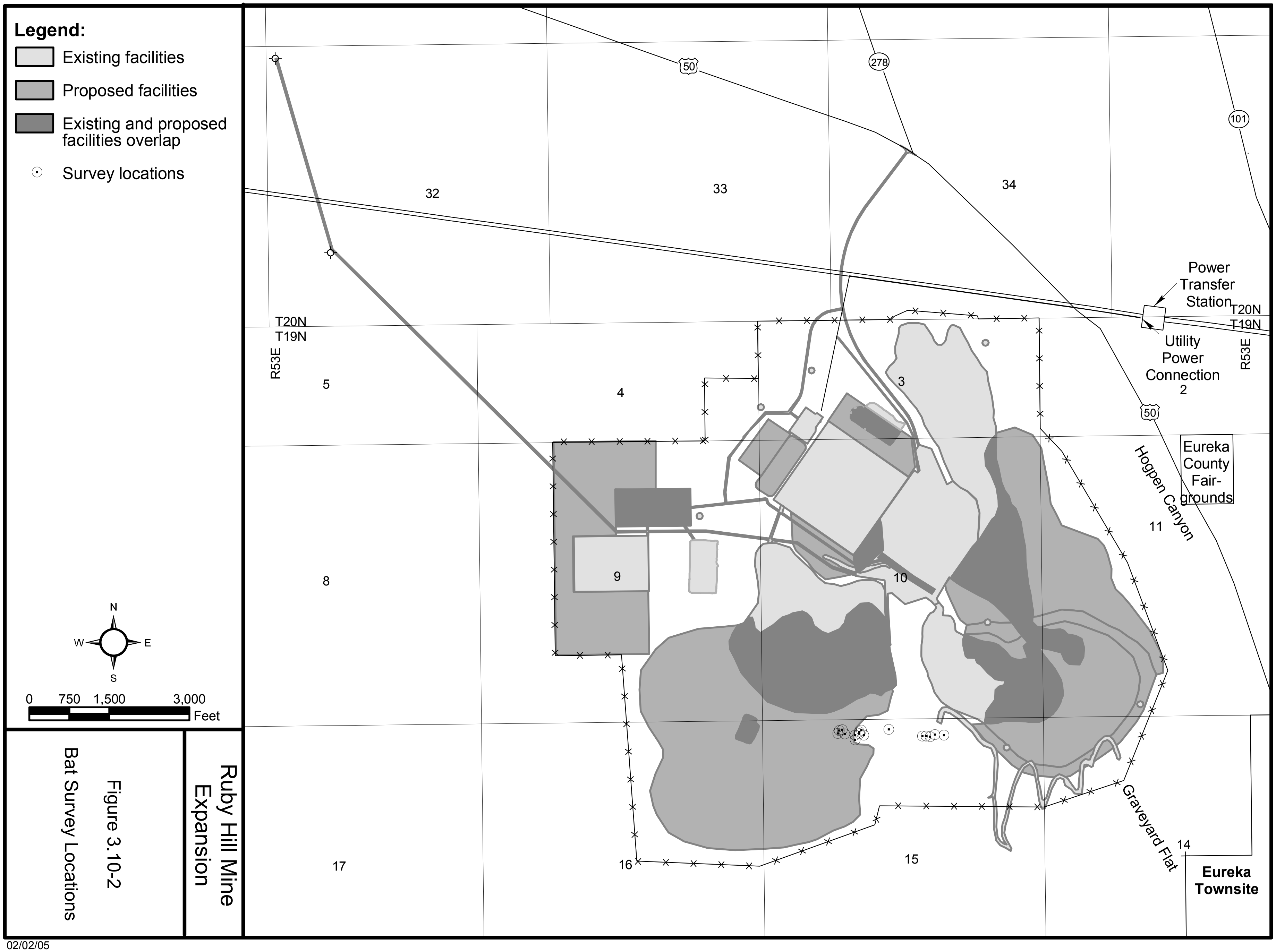
Loggerhead Shrike. The loggerhead shrike occurs in grasslands, shrubland, and piñon-juniper woodland habitats. The most common habitats for this species appear to be flat to gently rolling areas such as valley bottoms, alluvial fans, and the foothills of mountains. Nesting birds often use isolated trees or large shrubs and also may use vegetative stringers of greasewood for breeding and nesting (Andrews and Righter 1992). The shrub communities within the project area are representative of the shrub habitat commonly used by nesting shrikes. This species has been documented as occurring within the project area (JBR 2004c; WESTEC 1995b).

Mammals

Bat Species. Federal and state agencies identified a number of bat species as potentially occupying the appropriate habitat types in and near the project area (see **Table 3.10-1**). Rock outcrops, caves, mine shafts and adits, cliffs, trees, and buildings could provide day roost sites; caves and mines may be used for hibernacula or maternity roosts. As discussed in Section 3.10.1.2, Nongame Species, summer bat surveys were conducted annually from 1995 to 2003, and biannual winter surveys were conducted in 1996, 2000, 2002, and 2004, within shafts, adits, and other openings that may support both breeding and hibernating bat species in the project area. Other mitigation that has been implemented within the project area to protect bats and their habitat include sealing mine workings to discourage bats from re-entering mine shafts and adits that may be impacted by mining operations. Bat gates also were installed over two mine entrances into the Bullwhacker Mine to ensure public safety and secure habitat for bats roosting in the mine workings.

Bat surveys focused on existing mine components (e.g., shafts, adits) in and near the proposed disturbance areas. A 1922 mine map indicated that the Holly, Williamsburg, Bullwhacker, and Silver West mines are connected and would, therefore, be considered one complex for bat use (Brown 1996). The mine workings examined included six openings associated with the Bullwhacker complex, four entrances at the Silver West Mine, two Williamsburg shafts, five Holly shafts and declines, the Holly extension shaft, Shaft N, and three openings at the Cyanide Complex. Accessible mines were entered during the day to record any sign of bat occupancy. However, many of these mines were so complex or dangerous that they were not fully accessible. Workings not entered due to safety concerns were monitored during the summer surveys for a minimum of 90 minutes after dark, using night vision equipment (Brown 1996) and mist nets (Brown 2003). These survey locations are presented in **Figure 3.10-2**.

Table 3.10-4 presents the results of the summer and winter bat surveys in the project area. However, since limited mine access only allowed surveying a small portion (less than 20 percent) of the potentially available bat habitat in the mine complexes examined, additional bats and possibly other species would occupy the shafts and adits located in the project area. The survey results in **Table 3.10-4** did determine the presence of four BLM sensitive bat species and documented both nursery colonies and hibernacula (Brown 1996).



Ruby Hill Mine Expansion

Figure 3.10-2

Bat Survey Locations

Table 3.10-4
Sensitive Bat Species Survey Results for Existing Mines and Mine Complexes
(Summer 1995 - 2004, Winter 1996 - 2004[1])

Mine Name	Number of Openings Examined	Status of Mine Openings	Species Observations During Summer Surveys	Species Observations During Winter Surveys
Bullwhacker Complex	6	1 - Gated adit 2 - Gated culvert 3 - Open shaft 4 - Open shaft 5 - Boarded shaft 6 - Open shaft	- Small-footed myotis maternity colony[2] - Townsend's big-eared bat flights - Long-legged myotis flight - Big brown bat flight	Hibernaculum for small-footed myotis and Townsend's big-eared bat.
Silver West Complex	4	1 - Double shaft (1 collapsed, 1 open) 2 - Open shaft 3 - Open shaft (150 feet deep) 4 - Open shaft (50 feet deep)	- Townsend's big-eared bat flights - Small-footed myotis flights	No bat sign observed within accessible portions of mine.
Williamsburg	2	1 - Open shaft 2 - Closed 2003	- Townsend's big-eared bat flights - Small-footed myotis flights	Hibernaculum for small-footed myotis and Townsend's big-eared bat.
Holly Complex	5	Main - Fenced with chicken wire 1 - Closed 2003 2 - Closed 2003 3 - Fenced with chicken wire 4 - Closed 1996	- Townsend's big-eared bat flights - Small-footed myotis flights	Hibernaculum for small-footed myotis and Townsend's big-eared bat.
Shaft N	1	Fenced	Not surveyed	No bat sign observed within accessible portions of mine.
Cyanide Complex	3	Fenced	- Townsend's big-eared bat flights	Not surveyed.

[1]Summer surveys were conducted in 1995 and 2003 during the months of June through September. Winter surveys were conducted in January 1996, 1998, 2000, 2002, and 2004.
[2]This maternity colony is associated with the extensive mine complex potentially connecting the Silver West, Bullwhacker, Williamsburg, and Holly mines.

Source: Brown 1996, 2003, and 2004a,b.

During the summer surveys, the Townsend's big-eared bat and myotis species (likely the small-footed myotis) were recorded at all major historic mine sites that occur within the project area including the Bullwhacker, Williamsburg, Silver West, and Holly Mine complexes (Brown 2003). A maternity colony of the small-footed myotis was documented in the Bullwhacker complex, and one potential colony was located in the Holly Mine (assumed based on the number of bats exiting the underground openings). As the Bullwhacker, Williamsburg, Silver West, and Holly mine complexes are interconnected, it is likely that breeding bats use these extensive mine workings during the summer season (Brown 1996). Only a few Townsend's big-eared bats and small-footed myotis were observed at the Silver West Mine and Williamsburg shaft. These bats were likely males roosting alone or in small colonies during the summer, although no bats were captured to verify this assumption (Brown 1996). In addition, the workings around the Cyanide shaft area apparently has been used by the Townsend's big-eared bat, as indicated by the 1996 summer survey (Brown 1996).

In 1996, winter surveys documented over 100 hibernating small-footed myotis and 10 Townsend's big-eared bats in the Bullwhacker complex (Brown 1996). In 1998, the number had decreased to 25 small-footed myotis and 8 Townsend's big-eared bats, and in 2000, only 17 small-footed myotis and three Townsend's big-eared bats were documented in the Bullwhacker complex. In 2002, 29 small-footed myotis and 3 Townsend's big-eared bats were documented. Finally, in 2004, 32 small-footed myotis and 3 Townsend's big-eared bats were documented in the Bullwhacker complex (Brown 2004a). At the Holly Mine, 12 small-footed myotis were observed in 1998, 8 small-footed myotis and 12 Townsend's big-eared bats were found in 2000, and only 3 small-footed myotis were documented in 2004 (Brown 2004a). The apparent decline in the number of bats in Bullwhacker and Holly since 1996 could be the result of disturbance due to blasting vibration and/or increased human entry into the mine workings. A hibernaculum for small-footed myotis was recorded for the Williamsburg Mine, and a hibernaculum likely occurs in the Holly complex (Brown 1996). From the 1922 mine map, the surveyors estimated that only approximately 20 percent of the underground workings were examined; therefore, additional bats likely occupy this complex. Air flow is important, if not critical to hibernating bats, between the Williamsburg, Bullwhacker, and Holly complexes (Bradley 1996; Brown 1996).

The only other bats that were positively identified during the field surveys included the big brown bat and long-legged myotis (Brown 2003). However, other species may seasonally use these underground workings.

The following background information on sensitive bat species was summarized using a variety of sources, including the *Bats of Nevada* (no date) and *General Life History of Nevada Bats* (no date). Scientific names are provided in **Table 3.10-1**.

Pallid Bat. The pallid bat is a year-round resident in Nevada, occupying a variety of habitats such as piñon-juniper, blackbrush, cresote, sagebrush, and salt desert scrub. This species feeds primarily on large ground-dwelling arthropods (e.g., scorpions, centipedes, grasshoppers), but also feeds on large moths (Altenbach et al. 2002). The pallid bat is a colonial species, roosting in groups of up to 100 individuals (Arizona Game and Fish Department [AGFD] 1993). Roost sites consist of rock outcrops, mines, caves, hollow trees, buildings, and bridges (AGFD 1993; Altenbach et al. 2002). This species has not been documented within the project region (Altenbach et al. 2002).

Big Brown Bat. The big brown bat is a year-round resident in Nevada, occupying a variety of habitats including piñon-juniper, blackbrush, cresote, sagebrush, and salt desert scrub. This species gleans insects over water and open landscapes, as well as in both forested and edge settings (Altenbach et al. 2002). The big brown bat is a colonial species, roosting in groups up to several hundred. Roost sites include caves, mines, buildings, bridges, and trees. This species was documented using the Holly complex (Brown 2003).

Townsend's Big-eared Bat. The Townsend's big-eared bat is a year-round resident in Nevada, preferring caves, mines, and buildings that maintain stable temperatures and air flow for nursery colonies, bachelor roosts, and hibernacula (Altenbach et al. 2002). The Townsend's big-eared bat occupies a variety of habitats including desert scrub, piñon-juniper, other coniferous forests, broadleaf or deciduous forests, shrublands, and grasslands. This species gleans insects from foliage while foraging and roosts both singly and in colonies (Altenbach et al. 2002). This bat is highly susceptible to disturbance during hibernation; mortalities may result from as few as one disturbance during this critical period (Fitzgerald et al. 1994; Brown 1996). This species has been documented using all major mine workings within the project area.

Silver-haired Bat. The silver-haired bat is probably a transient spring and fall migrant that occupies coniferous and mixed deciduous/coniferous forests of piñon-juniper, subalpine fir, white fir, limber pine, aspen, cottonwood, and willow. This species gleans insects and moths in or near wooded areas and along edges of roads, streams, or waterbodies. This species roosts both singly or in small groups in hollow trees, rock crevices, mines, caves, and houses. This species has not been documented in the project region (Altenbach et al. 2002).

Small-footed Myotis. The small-footed myotis is a summer resident in Great Basin desert, shrub-steppe, and woodlands, with occasional reports in montane forests. It inhabits rocky areas and forages for insects in clearings, near rocks, and over forests. It is known to hibernate in caves and mines, and summer roosts have been recorded in buildings and mines, under tree bark, and beneath rocks (Altenbach et al. 2002; AGFD 1993; Fitzgerald et al. 1994). This species has been documented using all major mine workings within the project area. It is thought that maternity colonies contain 20 or fewer females with young, although the numbers in the Bullwhacker complex may exceed this estimate (Brown 1996).

Long-eared Myotis. The long-eared myotis is a summer resident in montane forests throughout Nevada, occupies mid-elevational piñon-juniper woodlands, and is dependent on perennial water sources within these woodlands. This species gleans insects (primarily small moths) over vegetation and open water while foraging. It roosts solitary or in small groups (Altenbach et al. 2002; Fitzgerald et al. 1994). Roost sites encompass buildings, hollow trees, caves, mines, rocky crevices, and other underground openings. Little is known about this species' use of hibernacula, but caves and mine adits and shafts support wintering bats, in addition to providing habitat for breeding populations. As discussed above, this species was documented using the Holly complex (Brown 2003). Lactating females also were captured in a 1994 summer survey near Mt. Hamilton in the White Mountains, located east of the project area (Brown 1996; Manning and Jones 1989).

Fringed Myotis. The fringed myotis is a summer resident in the Great Basin and has been reported in woodlands throughout the state. It occupies habitats ranging between desert scrub communities to higher elevation woodlands. In Nevada, piñon woodland is one of the most commonly used plant communities. This species gleans small insects (mainly moths) from foliage during foraging. Nursery colonies and hibernacula are often located in mines, caves, and buildings. Roosts may be in caves, rock crevices, mines, and buildings. Males typically roost singly (Altenbach et al. 2002). This species is susceptible to human disturbance, particularly during the breeding season (AGFD 1993). Fringed myotis were captured in the White Mountains to the east of the project area during the 1994 surveys (Brown 1996).

Long-legged Myotis. The long-legged myotis is a summer resident from Great Basin woodlands to montane forests. This species gleans insects above woodlands, over ponds, and along riparian corridors. Individuals typically day roost singly or in small groups in buildings, rock crevices, and loose tree bark. Night roosts and hibernacula are often in caves and mines (Altenbach et al. 2002). This species was documented using the Holly complex (Brown 2003).

Western Pipistrelle. The western pipistrelle is a year-round resident in Nevada, occupying desert habitats of blackbrush, creosote, salt desert scrub, and sagebrush, with occasional occurrence in ponderosa pine and piñon-juniper, usually in association with rock features such as granite boulders and canyons. This species gleans insects over open habitats. This species roosts both singly or in small groups in mines, caves, or occasionally in buildings and vegetation. This species has not been documented in the project region (Altenbach et al. 2002).

Pygmy Rabbit. The pygmy rabbit was petitioned to be federally listed under the ESA and is designated as a BLM sensitive species. Habitat requirements for this small burrowing rabbit include dense stands of big sagebrush or bitterbrush for both food and cover (Green and Flinders 1980) and deep, friable soils for their burrows (Wilde 1978). The species has an irregular distribution, limited to suitable stands of sagebrush and rabbitbrush (Dobler and Dixon 1990), often along riparian areas or alluvial fans. Sagebrush is important forage for this rabbit and is consumed year-round. In Nevada, the pygmy rabbit also is considered a game species.

Based on the vegetation analysis for the original Ruby Hill Project Final EIS (BLM 1997a), Wyoming big sagebrush and basin big sagebrush occur within the project area. Wyoming big sagebrush occurs primarily in the western portion of the project study area and within alluvial drainages in the central and eastern portions of the study area. Basin big sagebrush is limited to a relatively narrow area within Austin Canyon that runs north to south in the central portion of the project area.

In 1995 and 1996, field studies examined the potential presence, relative abundance, and overall distribution of the pygmy rabbit in the project area (WESTEC 1997a). The survey areas focused on habitats with a substantial sagebrush component. Pygmy rabbit sign was recorded along transects within the appropriate habitat types, providing estimates of relative abundance. Results from the field surveys found that pygmy rabbits were associated with vegetation communities that contained both basin big sagebrush and Wyoming big sagebrush. Pygmy rabbit sign was predominantly located in shallow, ephemeral drainages with tall, dense stands of sagebrush. The high relative abundance of rabbits was found primarily in areas with soft, friable soils, and low to moderate abundance was found more in the harder, rocky substrates. However, the height and density of the sagebrush appeared to be the same for both areas containing pygmy rabbit sign. Based on the survey results, it is highly likely that this species would occur within sagebrush habitats that would be affected by surface disturbance activities.

3.10.2 Environmental Consequences

The potential impacts of the proposed mine expansion on terrestrial wildlife can be classified as short-term and long-term. Short-term impacts arise from habitat removal and disturbance as well as from activities associated with the mine operation; these impacts would cease upon mine closure and completion of successful reclamation. Long-term impacts consist of permanent changes to habitats and the wildlife populations that depend on those habitats, irrespective of reclamation success. Direct impacts to wildlife populations could include limited direct mortalities from mine expansion development, habitat loss or alteration, incremental habitat fragmentation, and animal displacement. Indirect impacts could include increased noise, additional human presence, and the potential for increased vehicle-related mortalities.

The habitat mosaic and increased edge effect present along the foothill region in the project area support a greater number of species than either of the individual habitat types. As a result, project-related effects may be prominent for species closely associated with the juniper and sagebrush transitional zone. The degree of the effects on terrestrial wildlife species and their upland habitats would depend on factors such as the sensitivity of the species, seasonal use patterns, type and timing of project activity, and physical parameters (e.g., topography, cover, forage, climate).

Due to the lack of suitable habitat (perennial water sources) in the project area, or effect to perennial water sources as a result of dewatering activities (see Section 3.4, Water Quality and Quantity), no impacts to aquatic species or fisheries would occur as a result of the development or operation of the proposed mine expansion.

3.10.2.1 Proposed Action

Terrestrial Wildlife

Surface Disturbance. The greatest impact to wildlife from mine-related surface disturbance would be the temporary and permanent loss or alteration of habitat. This impact would result from construction and operation of the proposed mine expansion. Habitat loss or alteration would result in direct losses of smaller, less mobile species of wildlife, such as small mammals and reptiles, and the displacement of more mobile species into adjacent habitats. Displacement also could result in some local reductions in wildlife populations if adjacent habitats are at carrying capacity. Mine-related surface disturbance also would result in an incremental increase in habitat fragmentation at the mine site until vegetation has been reestablished. It is anticipated that the potential mine-related displacement and habitat fragmentation effects would be highest for wildlife species that typically are dependent on the transitional zone between the higher elevational juniper and low elevation sagebrush habitats.

The Proposed Action would result in the direct loss of approximately 744 acres of native vegetation, including 451 acres of primarily juniper habitat, 241 acres of low elevation sagebrush habitat, and 52 acres of winterfat/grassland habitat. The direct loss of habitat would be a long-term impact in much of the mine expansion area as vegetation would become reestablished following project reclamation, which would be conducted concurrently with mining as areas become available. However, some beneficial impacts would result where the reclaimed habitat would be different than it was before mining. These impacts would occur in areas where existing juniper vegetation would be removed and subsequently reclaimed with herbaceous species and woody shrub (i.e., sagebrush, serviceberry, mountain mahogany, and bitterbrush) seedlings. The use of woody shrub seedlings during mine reclamation would decrease the time to maturity. It is estimated that sagebrush would require up to 20 to 30 years to reach maturity. Juniper would be allowed to recolonize naturally and would require up to 50 years to reach maturity once established. The disturbance associated with the proposed pit expansion would not be reclaimed following the completion of mining, resulting in the direct permanent loss of approximately 100 acres of juniper woodland/sagebrush habitat.

No wetland/riparian vegetation would be affected by the Proposed Action. Therefore, no adverse effects to wetland/riparian habitat or associated wildlife species would occur. In addition, the steepness and configuration of the pit walls would preclude future development of wetland/riparian habitat.

Game Species. Potential direct impacts to mule deer would include the incremental long-term reduction of potential forage and the incremental increase of habitat fragmentation from construction and development activities at the mine site. The project would remove approximately 456 acres of mule deer year-long range and approximately 288 acres of low-density year-long range, of which approximately

100 acres associated with the pit expansion area would not be reclaimed (see **Figure 3.10-1**). No mule deer seasonal ranges designated as crucial by NDOW would be affected by the Proposed Action. Based on the sporadic use of the low-density year-long use in the project area (Podborny 1996), and the low availability of water relative to forage and cover, impacts to deer populations are expected to be low.

Impacts to mountain lions would be expected to be minimal, based on the infrequent occurrence of the species in the project area.

Direct impacts to small game species (i.e., cottontail rabbit and black-tailed rabbit) would include the long-term loss of potentially suitable breeding and foraging habitat, displacement, and habitat fragmentation, until vegetation is reestablished. Potential direct adverse impacts also could include burrow abandonment or loss of young. These temporary losses would reduce productivity for that breeding season. Potential impacts to the pygmy rabbit (a BLM sensitive species) are discussed in the Special Status Species subsection below.

Nongame Species. A variety of resident and migratory bird species (e.g., raptors and songbirds) have been identified as potentially occurring in the project area. Potential direct adverse impacts to bird species would include the temporary loss of approximately 644 acres and permanent loss of approximately 100 acres of potentially suitable breeding, roosting, and foraging habitat; however, this temporary loss is expected to have little effect on local bird populations based on the amount of suitable breeding and foraging habitat in the surrounding area. If construction or development of the proposed facility expansions were to occur during the breeding season (approximately April 15 through July 15, depending on species), direct impacts to breeding birds could include the possible direct loss of nests or indirect effects (e.g., abandonment) from increased human noise and human presence within close proximity of an active nest site. Loss of an active nest site, incubating adults, eggs, or young would be in violation of the Migratory Bird Treaty Act. In order to minimize impacts to breeding raptors, Homestake has committed to conducting breeding raptor surveys and implementing appropriate mitigation measures, as needed, in the event that initiation of the expansion project should occur during the raptor breeding season. In addition, for the protection of breeding songbirds, Homestake has committed to avoiding habitat removal, to the extent possible, between April 15 and July 15 or, alternately, conducting breeding bird surveys and implementing appropriate mitigation in coordination with the BLM and NDOW. With implementation of these measures, residual impacts to nesting bird species within the project area would be limited primarily to temporary habitat loss. This loss is, however, anticipated to have little effect given the extent of native habitats in the surrounding region.

The rerouted power line segment potentially could pose an electrocution hazard for raptor species attempting to perch on the structures. To minimize this potential impact, Homestake has committed to using a raptor-deterring design as discussed in Section 2.3.14, Applicant-committed Environmental Protection Measures. The new power line segment potentially would incrementally increase collision potential for migrating and foraging bird species. However, collision potential typically is dependent on variables such as the location in relation to high-use habitat areas (e.g., nesting, foraging, and roosting), line orientation to flight patterns and movement corridors, species composition, visibility, and line design (Avian Power Line Interaction Committee 1994). Based on the length (0.1 mile), location, and orientation of the proposed distribution line reroute in relation to low use habitat areas (existing disturbance areas), no adverse effects to avian species in the project vicinity would be expected from the operation of the rerouted distribution line.

Potential effects to upland game birds from mine development are expected to be low. The lack of known breeding sites (e.g., sage grouse leks) and water sources that would support brooding birds limit the overall habitat quality for western sage grouse, mourning dove, and California quail. The western sage grouse is a BLM sensitive species and is discussed in the Special Status Species subsection below.

Human Presence and Noise. The most common wildlife responses to noise and human presence are avoidance or accommodation. Avoidance would result in displacement of animals from an area larger than the actual disturbance area. The total extent of habitat loss as a result of the wildlife avoidance response is impossible to predict since the degree of this response varies from species to species and can even vary between different individuals of the same species. Also, after initial avoidance of human activity and noise-producing areas, certain wildlife species may acclimate to the activity and begin to reoccupy areas formerly avoided. In addition to avoidance response, increased human presence intensifies the potential for wildlife/human interactions ranging from harassment of wildlife to poaching and legal harvest.

Three factors would combine to help minimize the potential effects related to increased human presence in the project area. First, the Proposed Action is an expansion of an existing mine site where human activity associated with processing operations continues to date. Second, the location of the mine site is in close proximity to the town of Eureka and historical mines used since the late 1800s. Thirdly, Homestake has developed an environmental awareness course for employee orientation that was implemented in association with the existing Ruby Hill Mine and would continue to be implemented under the Proposed Action. Under the Proposed Action, this program would be required for all construction and operations personnel to inform them of applicable federal and state laws, caution against animal harassment, and develop an awareness of, and sensitivity to, wildlife issues and concerns specific to the project area.

Increased human presence and related increases in traffic levels on project access roads also increase the potential for wildlife/vehicle collisions. Although the number of personnel traveling to and from the site would increase over existing levels, the potential for increased wildlife mortalities from mine-related vehicles along the mine access roads is expected to be negligible, due to the relatively short access road into the mine and the proximity of U.S. Highway 50 to the project area.

Water Quality and Water Quantity. Wildlife populations in the project area could be affected by exposure to mine-related process solutions. Potential sources for wildlife exposure to these solutions would include the heap leach pad expansion (if cyanide solutions pool on the surface); process solution ponds; and the adsorption, desorption, and recovery plant. Process solutions present in these areas would contain potentially toxic levels of weak acid dissociable cyanide. Wildlife exposure to these solutions could result in mortalities.

To minimize the potential impacts of wildlife exposure to process solutions, Homestake previously implemented, and would continue to implement, the following committed environmental protection measures. Both, the existing closed, metal solution tanks and existing ADR plant, which would continue to be utilized under the Proposed Action, were constructed with secondary containment that drains to an existing solution overflow pond as discussed in Section 2.3, Proposed Action. In addition, existing and newly proposed storm event ponds located adjacent to the solution overflow pond would contain flow from a 25-year/24-hour storm event in addition to 110 percent of the largest process tank (550,000 gallons). To prevent wildlife access to the solution overflow and storm event ponds, Homestake would extend the fencing around the existing ponds to encompass the newly proposed pond. In addition, because the solution overflow pond may contain cyanide solution from surges in the processing operation, wildlife exclusion devices (e.g., netting or floating material) would continue to be used to prevent bird and bat access to the solution water. Solution from the heap leach pad expansion would be piped, rather than transported in open channels, to prevent wildlife access to the solution. Also, emitters would be used on the heap leach facility expansion, and monitoring would be conducted to identify areas of potential pooling of the cyanide solution on top of the heap. Homestake would implement a plan to minimize cyanide solution pooling.

Based on Homestake's committed environmental protection measures, potential impacts to wildlife resources from cyanide ingestion would be low. Homestake would report all wildlife mortalities to the BLM and NDOW, as discussed in Section 2.3.14, Applicant-committed Environmental Protection Measures.

As discussed in Section 3.4, Water Quality and Quantity, pit dewatering and water injection/infiltration activities would not affect any perennial stream, springs, or seeps. As a result, there would be no associated impacts to wildlife species.

As discussed in Section 3.4, Water Quality and Quantity, the water quality of the post-mining pit lake would meet Nevada stock water standards. ***In addition, the predicted pit lake water quality was evaluated in relation to U.S. Environmental Protection Agency criteria and Nevada standards for aquatic life, as well as the no observed adverse effect level benchmarks for drinking water consumption (Sample et al. 1996) for representative species. These evaluations indicate that the predicted water quality of the pit lake would not pose unacceptable risks to wildlife, either mammals or birds.***

Hazardous Materials Spill. The probability of a transportation-related spill of process chemicals along the proposed transportation route (SR 278) is discussed in Section 3.18, Hazardous Materials and Solid Waste. The sensitive resources identified along SR 278 that could be affected by a potential spill include the Humboldt River, Pine Creek, Pine Meadows, their associated riparian zones, and the wildlife species dependent upon them. A total of 10 miles of wetland areas would be crossed by the proposed transportation corridor.

The potential for wildlife exposure to toxic chemicals as a result of a spill would be greatest if an accident were to occur near aquatic habitats. Spills in dryland habitat would pose only minimal risk to most wildlife species since these spills would be adjacent to highways and could be rapidly contained and cleaned up.

In general, the materials of greatest concern would be sodium cyanide, sodium hydroxide, and diesel fuel. The effects of a sodium cyanide release would be highly variable and would depend on the amount of the release, the location of the release (e.g., dry upland area, wet meadow area, or flowing stream area), the species exposed, and the chemical conditions at the release location. The most likely effect of a potential release of sodium cyanide would be the poisoning of terrestrial or aquatic species. Animal species that drink contaminated water could suffer severe effects or death depending on the concentration of cyanide and the volume of the water consumed. Sodium cyanide solution decomposes rapidly when in contact with the atmosphere into poisonous and flammable hydrogen cyanide gas. Animal species that breathe this gas could suffer severe effects or death depending on the concentration of cyanide gas and the duration of exposure. Environmental effects of a cyanide spill or leak would be limited in extent and time of contamination, due to the rapid degradation of cyanide into benign elements when exposed to direct sunlight or oxygen.

Sodium hydroxide spilled onto the ground or into a water body has the potential to cause short-term damage to localized terrestrial and aquatic habitats. A sodium hydroxide release into a stream or other water body has the potential to raise the pH of the water and temporarily reduce populations of aquatic invertebrates, amphibians, and fish.

A diesel spill has the potential to contaminate soil, surface water, and groundwater in addition to harming aquatic life and vegetation. Although unlikely, such a spill also could ignite from the accident and cause a range fire. Since cleanup actions would take place immediately, diesel contamination has a low potential to result in long-term impacts to soil, surface water, and possibly groundwater.

The risk of wildlife exposure associated with accidental spills into aquatic habitats would be highly unlikely for several reasons. The probability of an accident and the resulting release of process chemicals would be low as discussed in Section 3.18, Hazardous Materials and Solid Waste, and areas of aquatic habitat adjacent to the proposed transportation route are limited. Hazardous chemicals would be transported via USDOT certified containers and transporters, and transportation of sodium cyanide and other chemical reagents would be in accordance with all applicable rules and regulations. In the event of a spill, a carrier would be required to implement appropriate emergency response measures as stipulated by state and federal regulations. In addition, as discussed in Section 2.3.13.2, Spill Prevention and Emergency Response, Homestake has implemented, and would continue to implement, an Emergency Response and Contingency Plan that establishes procedures for responding to accidental spills or releases of hazardous materials to minimize environmental risks.

Special Status Species

The primary issues related to special status wildlife species would parallel those identified above for general wildlife species, including the loss or alteration of native habitats, increased habitat fragmentation, animal displacement, and direct loss of wildlife. Potential impacts for the 20 BLM sensitive species identified as potentially occurring in the project area are discussed below. No impacts to federally listed or proposed or federal candidate species would occur as a result of the proposed mine expansion based on the lack of presence in the project area.

Birds. As discussed above for general raptor species, based on implementation of applicant-committed environmental protection measures, no adverse effects to sensitive raptor species have been identified in association with construction of the proposed power line realignment, and potential impacts to sensitive bird species related to exposure to process solutions would be low. Other potential species-specific impacts are discussed below.

Golden Eagle. No known golden eagle nest sites occur within the project area, and potential nesting habitat in the immediate project area is limited. As a result, it is anticipated that potential impacts to this species would be limited to migrating and foraging individuals. Direct impacts would include the temporary loss of approximately 644 acres of potential foraging habitat until reclamation has been completed and vegetation has been reestablished, and the permanent loss of approximately 100 acres of potential foraging habitat in association with the proposed pit expansion. This impact would be considered negligible based on the overall availability of suitable foraging habitat in the vicinity.

Ferruginous Hawk. Potential direct impacts to breeding ferruginous hawks as a result of mine expansion-related activities could include abandonment of a breeding territory or nest site or the potential loss of eggs or young, which would reduce productivity for that breeding season. Committed environmental protection measures, including nesting raptor surveys and implementation of mitigation measures, as applicable, as described above for general raptor species, would minimize impacts to breeding birds. In addition, Homestake may consider moving two of the artificial nests previously constructed to minimize impacts to breeding pairs as a result of the construction and operation of the existing Ruby Hill Mine. These two nest structures have not been used to date by breeding pairs, apparently due to location. Based on the implementation of these committed environmental protection measures, the results of the on site monitoring program between 1997 and 2004, and the existing level of activity at the site, potential impacts to this species as a result of the proposed mine expansion would be considered low to moderate.

Long-term impacts to potential breeding habitat of the ferruginous hawk would result from the loss of approximately 359 acres of juniper woodlands until mature juniper trees have reestablished in project disturbance areas (approximately 25 to 50 years). The proposed pit expansion would result in the permanent loss of approximately 92 acres of potential juniper woodland habitat for breeding ferruginous hawks. In addition, direct impacts would include the temporary loss of approximately 644 acres of potential foraging habitat, until reclamation has been completed, and the permanent loss of approximately 100 acres from the proposed pit expansion area. This impact would be considered negligible based on the overall availability of suitable foraging habitat in the vicinity.

Swainson's Hawk. Although a Swainson's hawk was observed perching on one of the previously installed artificial nest structures in the mine area, no nest sites have been documented for this species in the mine vicinity. As a result, it is anticipated that potential impacts to this species would be limited to migrating and foraging individuals. Direct impacts would include the temporary loss of approximately 644 acres of potential foraging habitat, until reclamation has been completed and vegetation has been reestablished, and the permanent loss of approximately 100 acres from the proposed pit expansion area. This impact would be considered negligible based on the overall availability of suitable foraging habitat in the vicinity.

Prairie Falcon. No impacts to breeding prairie falcons would occur as a result of the proposed mine expansion due to the lack of suitable nesting habitat in the project vicinity. Direct impacts would include the temporary loss of approximately 644 acres of potential foraging habitat until reclamation has been completed and vegetation has been reestablished, and the permanent loss of approximately 100 acres of potential foraging habitat (shrubland) in association with the proposed pit expansion. This impact would be considered negligible based on the overall availability of suitable foraging habitat in the vicinity.

Greater Sage Grouse. The greater sage grouse could nest in upland habitats in the project area; however, the lack of water, activity at nearby lek sites, and ongoing operations at the existing Ruby Hill Mine would limit the use of this area by brooding birds. However, to minimize potential impacts to sage grouse, Homestake has committed to placing anti-perching features on the relocated distribution line structures to discourage raptor perching. This measure would prevent increased predation on nesting sage grouse, if present in the project area, from the relocation of the distribution line, minimizing the potential for decreased reproductive success (Section 2.1.14, Environmental Protection Measures).

Direct impacts to this species would include the long-term loss of approximately 233 acres of wintering sagebrush habitat, and the permanent loss of approximately 8 acres of wintering habitat in association with the pit expansion. This impact would be considered negligible based on the overall availability of suitable wintering habitat in the vicinity.

Burrowing Owl. Although no occupied burrows or owl sign were recorded during the 1995 field surveys at the mine site, the grassland and shrubland vegetation that would be disturbed as a result of the proposed mine expansion is suitable for supporting breeding and foraging birds. Potential impacts to breeding pairs, if present, as a result of mine expansion-related activities could include abandonment of a breeding territory or nest site or the potential loss of eggs or young, which would reduce productivity for that breeding season. Committed environmental protection measures, including nesting raptor surveys and implementation of mitigation measures, as applicable, as described above for general raptor species, could minimize impacts to breeding birds. Direct impacts to this species could include the temporary loss of approximately 278 acres of potential grassland breeding and foraging habitat until reclamation has been completed and vegetation has been reestablished, and the permanent loss of approximately 3 acres of breeding and foraging habitat in association with the pit expansion. This impact would be considered negligible based on the overall availability of suitable breeding and foraging habitat in the vicinity.

Pinyon Jay. Based on the documented occurrence of this species in the mine area during 1995 and 2004 surveys and the presence of potentially suitable breeding habitat, direct impacts to breeding pairs as a result of mine expansion-related activities could include abandonment of a breeding territory or nest site or the potential loss of eggs or young, which would reduce productivity for that breeding season. To minimize these impacts, Homestake has committed to avoiding habitat removal, to the extent possible, between April 15 and July 15 or, alternately, conducting breeding bird surveys and implementing appropriate mitigation in coordination with the BLM and NDOW as discussed in Section 2.3.14, Applicant-committed Environmental Protection Measures. Long-term impacts to this species would result from the long-term loss of approximately 359 acres of potential juniper woodland breeding and foraging habitat, until mature juniper trees have reestablished in project disturbance areas (approximately 25 to 50 years), and the permanent loss of approximately 92 acres of potential breeding and foraging habitat in association with the pit expansion. This impact would be considered negligible based on the overall availability of suitable breeding and foraging habitat in the vicinity.

Vesper Sparrow. Based on the documented occurrence of this species in the mine area during 1995 and 2004 surveys and the presence of potentially suitable breeding habitat, direct impacts to breeding pairs as a result of mine expansion-related activities and applicable environmental protection measures to minimize these impacts would parallel those described above for the pinyon jay. Direct impacts to this species would include the temporary loss of approximately 233 acres of potential sagebrush breeding and foraging habitat until reclamation has been completed and vegetation has been reestablished, and the permanent loss of approximately 8 acres of potential foraging habitat (shrubland) in association with the proposed pit expansion. This impact would be considered negligible based on the overall availability of suitable breeding and foraging habitat in the vicinity.

Juniper Titmouse. Although this species has been documented as occurring in the area (JBR 2004c), no impacts to breeding pairs as a result of mine expansion-related activities would be anticipated based on the lack of potentially suitable breeding habitat (cavities in riparian vegetation juxtaposed to piñon-juniper) in the project area. Long-term impacts to this species would result from the loss of approximately 359 acres of potential juniper woodland foraging habitat, until mature juniper trees have reestablished in project disturbance areas (approximately 25 to 50 years), and the permanent loss of approximately 92 acres of potential foraging habitat in association with the pit expansion.

Loggerhead Shrike. Based on the documented occurrence of this species in the mine area during 1995 and 2004 surveys and the presence of potentially suitable breeding habitat, direct impacts to breeding pairs as a result of mine expansion-related activities and applicable environmental protection measures to minimize these impacts would parallel those described above for the pinyon jay. Direct impacts to this species would include the temporary loss of approximately 644 acres of potential breeding and foraging habitat until reclamation has been completed and vegetation has reestablished, and the permanent loss of approximately 100 acres of nesting and foraging habitat in association with the pit expansion.

Mammals

Bats. Of the nine sensitive bat species that could occur in the project area, four species (Townsend's big-eared bat, small-footed myotis, long-legged myotis, and big brown bat) have been documented during surveys (see **Table 3.10-3**). Implementation of the Proposed Action could result in direct and indirect impacts to local bat species and their habitat. Direct impacts would include the loss of foraging habitat, including the short-term loss of approximately 52 acres of grassland habitat, the long-term loss of approximately 592 acres of shrub and woodland habitat, and the permanent loss of approximately 100 acres of shrub and woodland habitat in association with the pit expansion. The proposed expansion of the West Waste Rock Disposal Area would result in the direct loss of potential habitat associated with the Silver West Complex, the openings to which would be buried by development of this facility. If this complex has underground connections with the occupied adits in the mine area, the closure of the Silver West Complex could alter air flow, and therefore indirectly affect the continued suitability of the occupied underground workings as hibernacula and/or maternity roosts. In addition, mine openings in the vicinity of the Bullwhacker, Cyanide, Holly, and Williamsburg mines that would not be secured for bat habitat (see Section 2.3.14, Applicant-committed Environmental Protection Measures) also would be closed, resulting in similar potential habitat impacts. In addition, proposed blasting activities could have similar impacts on air flow and associated habitat suitability if blasting vibrations should result in the shifting of underground structures.

In the event that mine blasting activities result in increased noise or vibrations in occupied habitat, impacts to bats could vary depending on season, extent of the disturbance, and species-specific sensitivity. If hibernating bats were disturbed, bat mortalities could result from the expenditure of energy reserves required for winter survival. Blasting also could result in the loss of roost sites, and potential direct mortalities to bats, from mine collapse. Loss of maternity roosts, nursery colonies, or hibernacula from development of the mine expansion, whether from disturbance, habitat loss, or mortalities, would be considered an adverse impact to the local bat population.

As discussed in Section 2.3.14, Applicant-committed Environmental Protection Measures, to minimize mine expansion-related impacts to bat species, Homestake has committed to maintaining the existing bat gates at Bullwhacker openings 1 and 2; constructing cupola structures at the openings of the main Holly shaft, the remaining Williamsburg shaft, and one of the stable remaining Bullwhacker shafts; and continuing monitoring of the remaining historic mine workings (for 3 consecutive years following installation of cupolas) that previously were identified as supporting bats.

Pygmy Rabbit. Development of the mine expansion facilities would result in the long-term loss of approximately 233 acres, and permanent loss of approximately 8 acres of potentially suitable sagebrush habitat (basin big sagebrush- and Wyoming big sagebrush-dominated habitats) for this species. This impact would be considered low to moderate, depending on the relative habitat quality, which has not been determined within the proposed disturbance areas that currently support sagebrush habitat. In addition, project construction likely would result in the direct mortalities of individual rabbits, if present. The loss of individual pygmy rabbits (a game species in Nevada) would not result in population-level effects.

3.10.2.2 No Action Alternative

Terrestrial Wildlife

Under the No Action Alternative, the proposed mine expansion would not be developed and the associated potential impacts to wildlife species would not occur. No additional disturbance-related activities resulting in habitat impacts would occur under this alternative. Ongoing reclamation would continue to reduce habitat impacts in existing disturbance areas. No impacts to nesting birds, including raptor and passerine species, would occur. Noise levels and human presence would remain the same as current levels until ongoing processing and reclamation have been completed, at which time these effects would cease.

Special Status Species

Potential impacts to special status species under this alternative would parallel those described above for terrestrial wildlife.

3.10.3 Cumulative Impacts

The cumulative impact area for wildlife and special status species is shown in **Figure 3.10-1**. Interrelated projects area identified in **Table 2-9**. For wildlife resources, the cumulative analysis focused on the historic and existing mining activities in the region combined with current mining exploration programs, limited livestock grazing, and habitat conversion associated with the BLM-managed fire management program in the Eureka area.

Cumulative impacts to wildlife resources primarily would be directly related to habitat loss, habitat fragmentation, and animal displacement. Wildlife most susceptible to these cumulative impacts would be nesting raptors in the cumulative impact area, since encroaching human activities along the foothills of the Diamond Mountains have resulted in bird displacement and habitat fragmentation in areas that may be at their relative carrying capacity for these resident species. Many of the local wildlife populations (e.g., mule deer) that occur in the cumulative impact area would continue to occupy their respective ranges and breed successfully, although population numbers may decrease relative to the amount of cumulative habitat loss and disturbance from incremental development.

Past and present actions in the cumulative impact area have resulted in the direct disturbance of approximately 5,840 acres of wildlife habitat. Future underground mining, if it should occur, likely would not result in additional habitat disturbance. The Proposed Action would increase habitat disturbance by an additional 744 acres, resulting in an incremental increase in related wildlife impacts. A portion of the cumulative disturbance area has been, or would be, reclaimed. In addition to direct habitat disturbance, approximately 2,087 acres of habitat conversion has resulted in association with the BLM-managed fire management program in the Eureka area. This program has resulted in a reduction in woody shrub and juniper habitats in the project vicinity. The reclaimed areas, and areas associated with habitat conversion, would be capable of supporting wildlife use; however, species composition and densities would change.

Indirect impacts associated with human presence and noise incrementally would increase in the cumulative impact area during the life of the proposed mine expansion. The contribution of the Proposed Action to these impacts would be short-term and temporary and would cease following completion of operations and final reclamation.

3.10.4 Mitigation and Monitoring

Issue: Direct loss of habitat exhibiting high relative abundance of pygmy rabbits, if present in the proposed mine expansion areas, would be considered a moderate impact.

Mitigation Measure WR1: Prior to construction of mine expansion facilities, a qualified biologist would conduct surveys in the areas containing basin big sagebrush and Wyoming big sagebrush habitats to determine the relative habitat quality for the pygmy rabbit. If habitat exhibiting high or moderate relative abundance of pygmy rabbits were identified, Homestake would coordinate with the BLM on applicable mitigation measures, as needed.

Effectiveness: This measure would allow for the evaluation of potential mitigation prior to surface disturbing activities to reduce direct impacts to the pygmy rabbit, if the need is identified.

3.10.5 Residual Adverse Impacts

Residual effects to wildlife resources from the Proposed Action would include the short-term loss of approximately 52 acres of grassland habitat, long-term loss of 592 acres of shrub and woodland habitat, and the permanent loss of 100 acres of shrub and woodland habitat in association with the proposed pit expansion. Development of the pit expansion area would result in the permanent loss of approximately 100 acres of native terrestrial habitats; however, development of the post-mining pit lake could result in additional aquatic habitat availability.

3.11 Land Use Authorizations and Access

The land use and access study area for direct and indirect impacts is the existing Ruby Hill Mine study area, which includes the proposed mine expansion area. The cumulative impact area includes the Ruby Hill Mine permit boundary and all public lands in the vicinity of the Eureka townsite identified as suitable for disposal by the BLM.

3.11.1 Affected Environment

3.11.1.1 Land Use Authorizations

Approximately 80 percent of Eureka County is under federal custodianship. The BLM manages approximately 75 percent (2,021,141 acres) of the land in the county, while the USFS manages approximately 5.4 percent (144,139 acres). Private lands comprise approximately 19 percent (504,738 acres) of the County and are used mostly as rangeland and for the production of hay and alfalfa (Eureka County Economic Development Council 1995).

Diamond Valley, to the north of the project area, contains numerous agricultural enterprises that rely on groundwater for the irrigation of alfalfa and barley. The closest residence west of the project area is located on the Minoletti Ranch, approximately 0.2 mile to the northwest. Several homes also exist in this area on the south side of U.S. Highway 50. Immediately west of the Minoletti Ranch is the Collingwood Ranch, which formerly was used for the production of alfalfa; all but 5 acres of the ranch have been purchased by Homestake.

Land use within the project area consists primarily of livestock grazing, mineral exploration, and dispersed recreational use. Public and private land ownership status in the vicinity of the study area is shown in **Figure 2-1**. The project area is composed of private land owned by Homestake and public land administered by the BLM Battle Mountain Field Office. Homestake purchased the surface title of a portion of the project area encompassing the existing Ruby Hill Mine from the U.S. in 2003. The mineral title of the 2003 purchase remained with the U.S.

The project area is located approximately 0.7 mile northwest of the town of Eureka. Eureka, the County Seat, is the largest of three towns in Eureka County with a population of approximately 900 in the community and surrounding area, approximately 500 of which are in the municipal limits of Eureka. The other two towns, Beowawe and Crescent Valley, are sparsely populated and are located in the northern portion of the county (Eureka County Economic Development Council 1995). The total population of Eureka County according to the 2000 census was 1,651, an increase of 6.7 percent from 1990. U.S. Highway 50 passes through Eureka, and runs to the east and north of the project area.

Livestock grazing occurs throughout the region on private and public lands (see Section 3.7, Range Resources). As discussed in Section 2.2, Existing Facilities and Disturbance, the Eureka Mining District has been mined intermittently for gold, silver, and lead since the 1860s. Gold and silver production continues to date at the existing Ruby Hill Mine.

An existing 230-kilovolt (kV) and a new 345-kV transmission line are located within a utility corridor that passes along the northern perimeter of the project area and roughly parallels U.S. Highway 50 to the west; a power transfer station is located across the highway, less than 1 mile to the northeast. Other ROWs within the project area include a buried water pipeline that lies along the eastern perimeter of the project area within Hogpen Canyon. This pipeline serves the town of Eureka, and continues in a southerly direction to the town water storage tank located on Tank Hill. A booster pump station for this water line is located in the center of Section 11, T19N, R53E. **Table 3.11-1** summarizes existing ROWs within the project area. The entire project area occurs within an area indicated on plat maps maintained by the BLM as having potential for oil, gas, and geothermal leasing.

Table 3.11-1
ROWs Within the Ruby Hill Mine Area

Serial Number	Type of Land Use	Location	ROW Width (feet)
Nev 06317	U.S. Highway 50	T20N; R53E; S 28, 33, 34	400
N-19823	Sewer line	T19N; R53E; S 2, 11, 14	--
N-54498	Access road	T20N; R53E; S 28, 33	66
N-5253	Powerline	T20N; R53E; S 31, 32, 33, 34	125
N-48618	Pipeline	T20N; R53E; S 33, 34 / T19N, R53E; S 2, 3, 11, 14	50
N-5638	Powerline	T19N; R53E; S 2, 11, 14	25
N-50847	Powerline	T19N; R53E; S 11	25
N-46712	Water pipeline to fairgrounds	T19N; R53E; S 2, 11	--
N-48618	Pipeline pump station	T19N; R53E; S 11	--
N-51905	Powerline	T19N; R53E; S 11	25
N-60359	Access road	T19N; R53E; S 14	30
N-60801	Buried water line and service road	T19N; R53E; S 4,5,9,10 / T20N; R53E; S 32	20
N-60802	Power line	T19N; R53E; S 3,10 / T20N; R53E; S 34	12.5
N-8100	Power line	T19N; R53E; S 14, 22, 23, 27, 34	12.5
N-10570	Telephone line	T19N; R53E; S 14, 22, 23, 27, 34	10
N-6400	Communication site and access road	T19N; R53E; S 22, 27, 34	12.5
N-76028	Buried power line	T19N; R53E; S 22, 27, 34	12.5
N-37190	Buried telephone line	T20N; R53E; S 28, 33, 34 / T19N; R53E; S 2, 11	10
N-63162	Powerline	T20N; R53E; S 32, 33, 34	160
N-66394	Fiber optic cable	T20N; R53E; S 31, 32, 33, 34	15
CC-21890	SR 278	T20N; R53E; S 28, 33, 34	400
CC-022840	Access road	T19N; R53E; S 13, 14, 22, 23	40
Nev 067106	SR 101	T20N; R53E; S 28, 33, 34	20

3.11.1.2 Relevant Plans and Policies

Eureka County currently has no zoning ordinance to guide development of private lands within the county. The Eureka County 1973 General Plan, updated in 2000, contains a description of local land uses, restrictions to development, and recommendations for future land use planning. The county's Overall Economic Development Plan, approved by the County Commissioners in 1997, was developed in order to broaden the economic development of the county. It contains recommendations for planning of land uses and designates the project areas as being within land class "C", Open Space and Appropriate Uses, which includes mining, recreational use, limited grazing, and watershed protection measures.

The county, in cooperation with the Nevada Division of State Lands, has adopted a Policy for Public Lands within its jurisdiction (Eureka County 1985). This plan was developed in response to Nevada Senate Bill 40, which directs the State Land Use Planning Agency to work with local planning entities to prepare local plans and policy statements regarding the use of federal lands in Nevada. Policies contained within the plan include promoting expansion of mining operations/areas, and promoting opportunities for local economic development through the disposal of select public lands within the county.

Public lands under BLM jurisdiction are managed for the multiple uses of recreation; range; forestry; mineral extraction; watershed; fish and wildlife habitat; wilderness; and natural scenic, scientific, and historical values. The project area lies within the BLM's Battle Mountain District. The current operational land use plan for this area is the 1986 Shoshone-Eureka RMP. This plan covers BLM-administered lands in parts of Lander, Eureka, and Nye counties. Land use planning maps generated by the BLM as part of the RMP indicate that the Proposed Action is located within an area identified as containing prospectively valuable oil and gas deposits. In addition, a portion of the proposed East Waste Rock Disposal Area expansion is on lands designated in the RMP as suitable for disposal; however, mineral resource development is in conformance with the RMP. These lands, as shown in **Figure 3.11-1**, could allow for future expansion of the Eureka townsite. Eureka County's *Policy Plan for Public Lands* (1995) encourages the orderly disposal of these lands in order to provide maximum public benefit.

3.11.1.3 Access

Primary access within Eureka County is provided by U.S. Highway 50, state highways, county roads, and public access roads. The majority of the public lands are accessible to the general public via these road systems.

There are many routes to access public lands near the project area. Access to the project area currently is provided via U.S. Highway 50, SR 278, and publicly-maintained roads in the vicinity of Eureka. U.S. Highway 50 is the primary east-west highway in central Nevada. It connects the Eureka townsite with Ely and destinations farther east, and Carson City and destinations farther to the west. SR 278 is the primary north-south link in Eureka County, which intersects U.S. Highway 50 north of Eureka and Interstate (I)-80 at Carlin (Elko County). Both roads are paved, lightly traveled two-lane roads. Access to the project site currently is provided via a private access road from U.S. Highway 50 to the north of the project area.

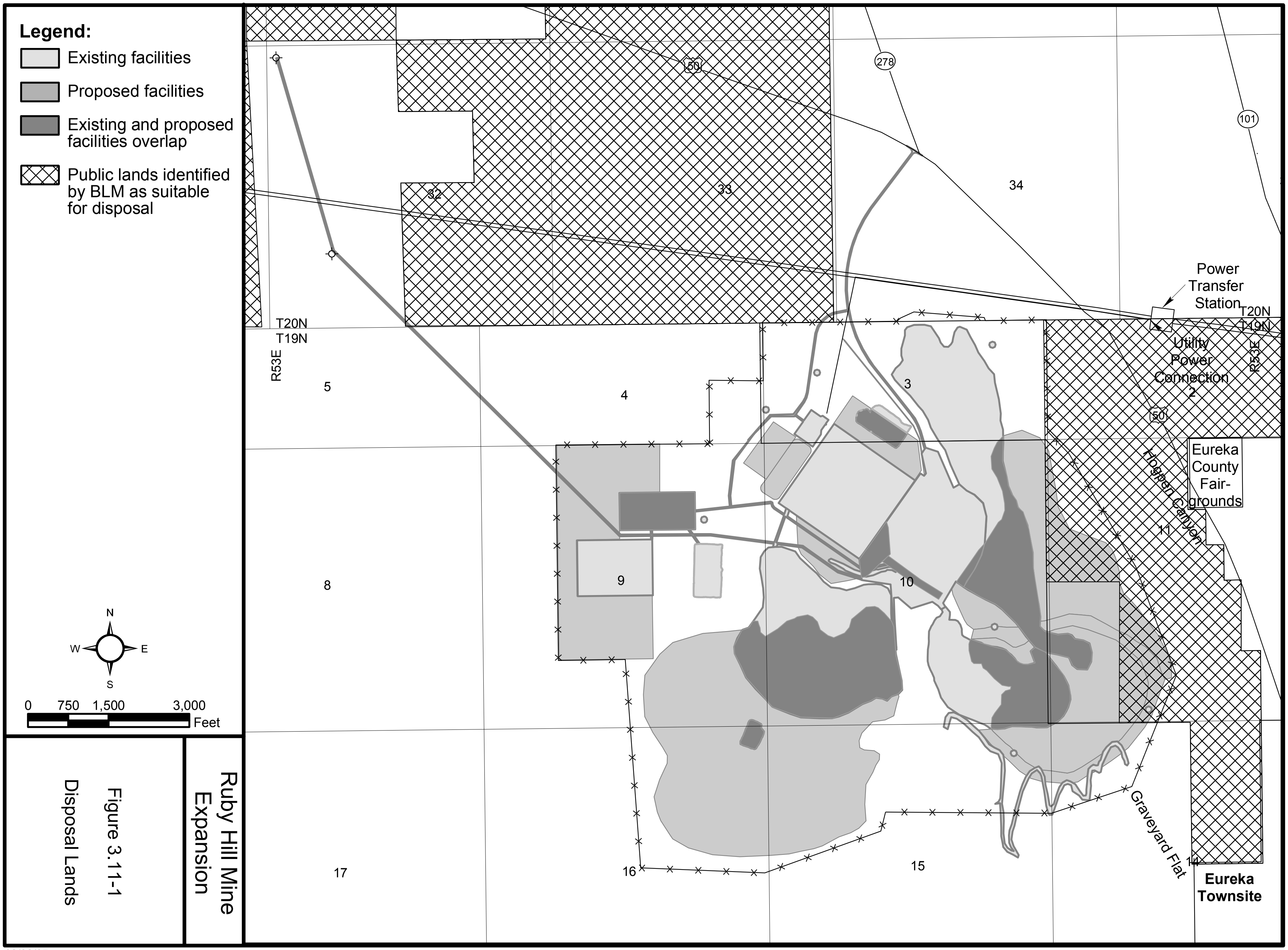
3.11.2 Environmental Consequences

The Proposed Action could affect land use authorizations and access both directly and indirectly. Direct effects may include the modification or termination of authorized land uses, rights-of-way, or access routes in the project area. Indirect impacts may occur as a result of altered access to areas adjacent to or within proximity to the mine site. Indirect effects also would result if the Proposed Action stimulated or encouraged the development of land uses not presently anticipated, or conversely, precluded other planned or proposed uses.

3.11.2.1 Proposed Action

Land Use Authorizations

The Proposed Action would create surface disturbance on approximately 744 acres, which primarily are private lands owned by Homestake Mining Company, with the exception of approximately 190 acres of



Ruby Hill Mine Expansion

Figure 3.11-1

Disposal Lands

public land administered by the BLM. Mining activities on private lands would be consistent with land use designations of the Eureka County Overall Economic Development Plan. However, a portion of the Proposed Action would occur on lands designated in the BLM's Shoshone-Eureka RMP as suitable for disposal (see **Figure 3.11-1**). During the life of the mine, a total of approximately 112 acres within the fenced mine area designated by BLM as suitable for disposal would not be available for disposal. However, mineral resource development is in conformance with the RMP, which states that "all public lands in the planning areas will be open to mining and prospecting unless withdrawn or restricted from mineral entry." Even after project reclamation, use of this land would be limited, and it is likely that disposal only would meet the needs of dispersed recreation (with the exception of approximately 25 acres that would be used for development of the mine pit expansion) and/or the creation of blocked ownership patterns, as the land would not be available for community expansion, economic development, or agriculture. However, it is unlikely that the affected disposal lands could ever have been used for these purposes, given their distance from the current townsite and highway and their limited agricultural potential. Although portions of the Proposed Action would be located on public lands identified for disposal (112 acres), the impact would not be expected to affect the future growth of the Eureka townsite as public lands identified as suitable for disposal exist adjacent to the current town boundary (see **Figure 3.11-1**), and an area immediately north of town has been identified by the County as the highest priority for annexation. Further, the Proposed Action would serve to stimulate growth within other undeveloped portions of the townsite.

The Proposed Action would preclude public use of the affected lands for the life of the mine. For both safety and security reasons, public access to the active mining and processing areas would be precluded to the maximum extent permitted by law during the life of mining. The entire area of operations, including haul roads, would be enclosed within a range control fence and would not be accessible to the general public.

Land use in the Eureka townsite would not be directly affected by the Proposed Action during construction and operations. The potential social and economic impacts of the proposed mine expansion are discussed in Section 3.17, Social and Economic Values.

See Section 3.7, Range Resources, relative to mine-related impacts on grazing.

Rights-of-Way

Under the Proposed Action, an approximately 0.1-mile-long section of the existing power line that currently provides power for the existing Ruby Hill Mine would be relocated to accommodate the leach pad expansion (see **Figure 2-3**). This utility ROW would be located on private land.

Access

Project access would continue to be from U.S. Highway 50, along the existing access road (see **Figure 2-3**). This access location was selected in order to minimize the amount of heavy truck and vehicular traffic that would be required to pass through the town of Eureka, since most mine deliveries are expected to arrive via either U.S. Highway 50 from the west or SR 278 from the north.

Ore hauling is proposed from the Ruby Hill Mine to the Goldstrike Mine, located to the north/northwest of Carlin, via SR 278 to Bush Street in Carlin to SR 766. Ore shipments from the Ruby Hill Mine to Goldstrike would result in up to 14 additional round trips per day in 2012. In other years, there would be substantially fewer trips (see **Table 2-3**). These shipments would have minimal impact on SR 278 north, which averaged 570 daily trips in 2000. There would be a slight impact in the town of Carlin, which had an average of 170 trips on Bush Street, east of SR 278 toward SR 766 in 2000. The largest impact on this road section would occur in 2012, when an increase of approximately 16 percent in average daily trips above 2000 levels would occur.

The Proposed Action is not expected to have an adverse impact on access to public and private lands in the study area. The publicly-maintained road that traverses Hogpen Canyon would remain open to the public.

An 8-foot chain-link security fence would be installed around the ultimate perimeter of the expanded pit after mining has been completed. A safety berm would be constructed inside the chain-link fence. A security gate at the main entrance to the mine area currently prevents, and would continue to prevent, unauthorized public access. Alternate routes to public and private lands in the mine vicinity would be available.

Closure/Reclamation

Closure, abandonment, and reclamation under the Proposed Action would return public lands to their premining land use as rangeland, wildlife habitat, and dispersed recreation. Except for the open pit, all other areas would be reshaped and revegetated, and public access would be established.

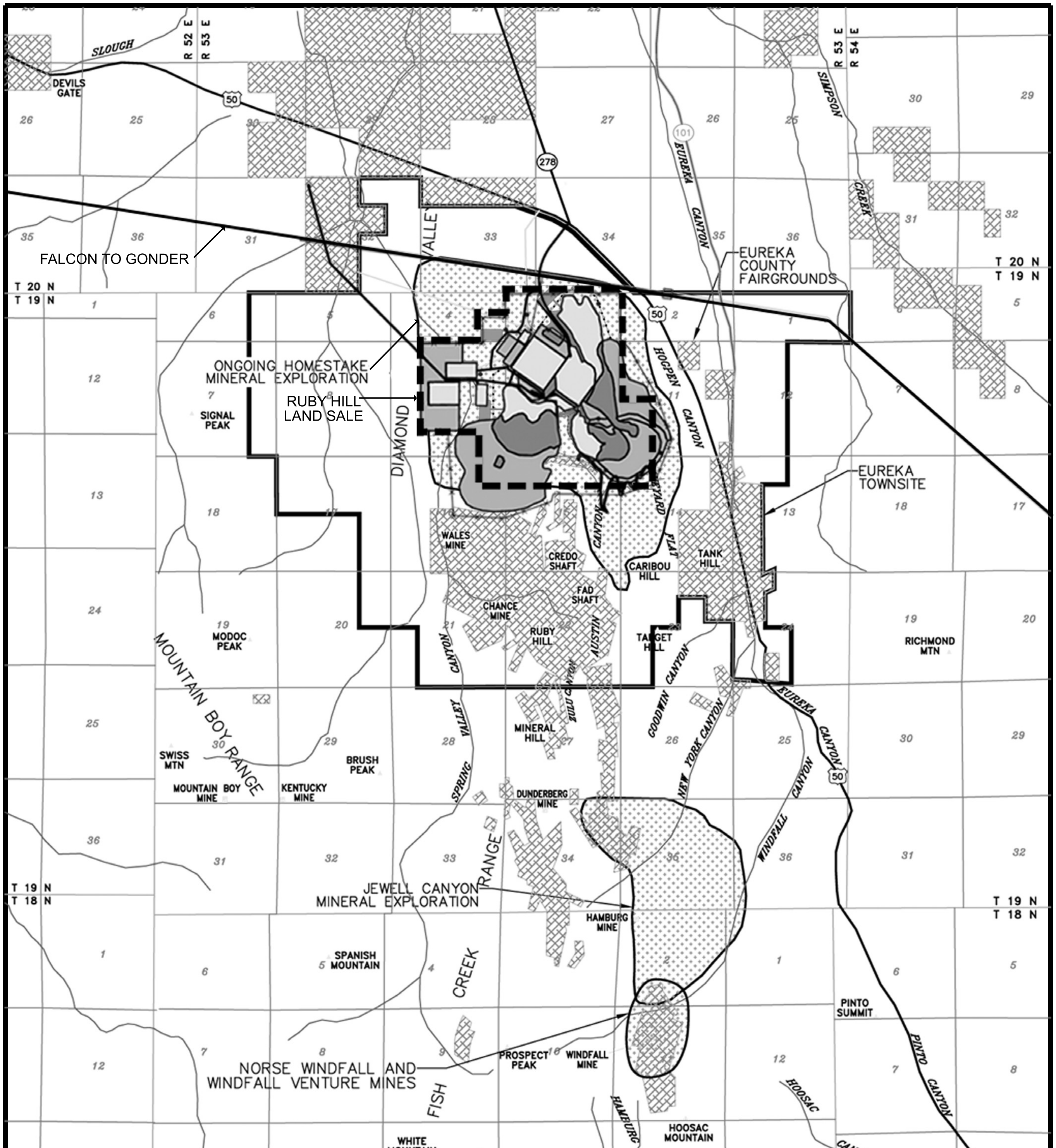
Safety berms, a barbed-wire fence, and warning signs would be placed around the perimeter of the expanded pit to prevent public access. Reseeding would increase vegetative cover and make the area suitable for livestock grazing. Livestock grazing may be resumed on public lands after re-established vegetation is capable of supporting grazing, as determined by the BLM.

3.11.2.2 No Action Alternative

Under the No Action Alternative, additional disturbance to lands within the project area would not occur. Access to public land in the project area would be preserved, and the existing land uses would be maintained, including grazing on the Ruby Hill Grazing Allotment. Lands identified as suitable for disposal by the BLM would not be affected.

3.11.3 Cumulative Impacts

The cumulative impact area for land use authorization and access is presented in **Figure 3.11-2**. Interrelated projects are identified in **Table 2-9**. Of the interrelated projects, the ongoing mineral exploration by Homestake has the potential to disturb additional public lands in the Eureka townsite vicinity identified by the BLM as suitable for disposal. In 2003, Homestake purchased 1,644 acres of land identified for disposal by BLM. This had minimal impact on the town of Eureka as other acreage identified for disposal by the BLM is available closer to the townsite. Exploration activities alone would not be expected to preclude future uses of disposal lands for recreation, other public purposes, community expansion, economic development, agriculture, or the creation of blocked-ownership patterns.



Legend

- Past disturbance
- Present disturbance
- Existing facilities
- Proposed facilities
- Existing and proposed facilities overlap
- Cumulative assessment boundary

N W E S

0 1 2 Miles

Ruby Hill Mine Expansion

Figure 3.11-2

Cumulative Impact Area for Land Use Authorization and Access

10/26/04

As identified in Section 2.6.2, it is reasonably foreseeable that Homestake could purchase approximately 400 additional acres of land, including the lands proposed for disturbance by the East Archimedes Project. As these lands are adjacent to lands currently owned by Homestake, this land purchase would have minimal impacts on local land use. Future underground mining at Ruby Hill is not anticipated to result in additional surface disturbance; therefore, additional land use impacts are not anticipated.

See Section 3.7, Range Resources, relative to cumulative grazing impacts.

3.11.4 Mitigation and Monitoring

No monitoring or mitigation is recommended for land use authorizations or access.

3.11.5 Residual Adverse Impacts

Residual impacts to land use authorizations relate primarily to the success of the reclamation efforts. If, following project completion, the affected land area is reclaimed such that former land uses can be reinstated, residual adverse effects would be limited to approximately 25 acres of public land that would be permanently altered and restricted as a result of the proposed pit expansion.

3.12 Recreation and Wilderness

The recreation and wilderness resources study area for direct and indirect impacts is the original Ruby Hill Mine study area, which includes the proposed mine expansion area. The cumulative impact area includes the area within a 45-mile radius of the Eureka townsite (e.g., the area within an approximate 1-hour drive from this population center).

3.12.1 Affected Environment

3.12.1.1 Recreation

The Nevada Statewide Comprehensive Outdoor Recreation Plan (1992) reports that recreation opportunities in Eureka Count are very limited, and that local demand for hunting, fishing, and golf are very high. However, hunting is the only activity that is readily available. The Statewide Comprehensive Outdoor Recreation Plan also has identified an increasing demand among county residents for a reservoir with a campground and picnic area, and for a golf course. The plan also reports that increasing numbers of Las Vegas area residents are traveling to Eureka, Lincoln, and White Pine counties to enjoy uncrowded conditions for their outdoor recreational activities (Nevada Division of State Parks 1992).

Dispersed outdoor recreation is the predominant type of recreation in the region. Dispersed recreational activities in the project area occur mostly in the Simpson Mountain Range and Diamond Mountains located west and east of the project area, respectively, and include hunting, hiking, backpacking, horseback riding, mountain biking, cross-country skiing, snowmobiling, camping, picnicking, sightseeing, rockhounding, photography, and off-road vehicle use. There are no off-road vehicle use restrictions within the BLM's Battle Mountain District, except within WSAs where motorized vehicle use is limited to existing travel routes (BLM 1983).

The region provides hunting opportunities for a variety of game animals, including mule deer, mountain lion, sage grouse, chuckar, cottontail rabbit, quail, pigeon, dove, and waterfowl. Hunting for big game is regulated through a quota system established by NDOW. The quota system is over-subscribed each year for deer tags because demand far exceeds supply (NDOW 1995).

No developed campgrounds or picnic areas exist within Eureka County. The closest developed facility is Illipah Reservoir, located approximately 35 miles to the east. This BLM-administered site is approximately 300 acres and has 17 camp sites. Recreation opportunities at Illipah include boating, camping, fishing, hiking, hunting, picnicking, and water sports. The Hickison Petroglyph recreation area is located approximately 40 miles west of the project area. This BLM-administered site contains 16 developed campsites (auto-accessible), two restrooms, picnic facilities, and a 0.75-mile interpretive walking trail that features petroglyph carvings left by early inhabitants of the region. The only other recreation site within 50 miles of the project area is the BLM-administered Tonkin Springs recreation area. This undeveloped recreation area, located approximately 35 miles northwest of Eureka, is used mostly by local residents and provides opportunities for fishing, primitive camping, and picnicking.

Recreational use within the vicinity of the project area is limited. Dispersed activities that occur near the project site include off-road vehicle use, hunting, and rockhounding.

Developed urban recreational facilities in the town of Eureka include a school play area, community park, tennis court, indoor swimming pool, football field and track field, two softball/baseball complexes, and an indoor multipurpose gym. The Perdiz Sports Shooting Range facility contains archery, sporting clay, trap, rifle, and pistol ranges. The County Fairgrounds, with a rodeo arena, are located in the town of Eureka (Eureka County Economic Development Council 1995).

3.12.1.2 Wilderness

No designated wilderness areas or WSAs exist within 10 miles of the proposed project area. The closest designated wilderness is the Currant Mountain Wilderness, located in the Humboldt National Forest approximately 45 miles to the southeast. This wilderness is approximately 36,000 acres in size and is administered by the USFS. The closest WSA is the Roberts Mountains WSA, located in central Eureka County, approximately 28 miles northwest of the project area. This WSA, administered by the BLM, is approximately 15,000 acres in size and offers abundant opportunities for sustained high-elevation hiking and horseback riding, hunting, sightseeing, photography, and historical and archaeological study (BLM 1987). This area presently is being managed by the BLM in accordance with the Interim Management Policy and Guidelines for Lands Under Review (BLM 1993) in order to prevent impairment of its wilderness values until Congress either designates the area (and other WSAs in Nevada) as Wilderness or releases it from the wilderness review process through legislation.

3.12.2 Environmental Consequences

3.12.2.1 Proposed Action

No parks, concentrated recreational use areas, BLM WSAs, designated wilderness areas, or protected natural areas would be directly affected by the Proposed Action. Implementation of the Proposed Action would withdraw additional lands previously available for dispersed recreation during construction, operation, and reclamation activities. Recreational activities, such as hunting, off-highway vehicle use, and hobby rock collecting, would be prohibited within the mine site during the life of the project. Overall, the reduction of land available for dispersed recreation (approximately 190 acres during mining, approximately 25 acres of which would be associated with the pit expansion and would be permanently excluded) would be a minimal adverse impact since existing recreational use in the project area is relatively light, and the area has abundant public, open-space lands available for dispersed recreational opportunities. Public access would not be restricted on public roads near the mine site. Although no specific recreational use data for public lands directly affected by the proposed project are available, the number of dispersed recreationists that would be affected is expected to be minimal, and their displacement would not create overuse of other areas or degradation of the resource.

Mine expansion-related impacts to big game populations within the project vicinity are expected to be low (see Section 3.10, Wildlife Resources). Given the low level of this impact and the diversity of public lands available locally for hunting, no impact to hunting opportunities is anticipated.

Developed recreational facilities within the region are not expected to be adversely impacted by an influx in mine expansion-related construction and operations work forces. Facilities at the Hickison Petroglyph Recreation Area, located approximately 40 miles west of the existing Ruby Hill Mine, could experience increased use as a result of transient workers camping during the construction period and the addition of new residents to the region during project operations. Other regional recreational facilities such as Tonkin Springs likely would experience increased demand during construction and operations phases.

Based on previous accommodation of the original Ruby Hill Mine work force, it is anticipated that recreational facilities located within the Town of Eureka would be able to absorb any additional demand placed on them as a result of the anticipated new residents to the area.

It is anticipated that the Proposed Action would have no direct effect on recreational use of the Roberts Mountains WSA. Slight increases in mountain recreation and wilderness use from the mine expansion work force would not adversely affect recreational opportunities or wilderness values in the area.

Closure, abandonment, and reclamation under the Proposed Action would return public lands in the project area to their pre-mining land use as rangeland, wildlife habitat, and dispersed recreation, with the exception of the portion of the pit expansion area (approximately 25 acres of public land) that would be restricted for safety reasons. Following mine closure, the privately owned lands in the project area, including the remainder of the pit expansion area, would remain under private ownership and would not be available for public recreation.

3.12.2.2 No Action Alternative

Under the No Action Alternative, the proposed mine expansion would not be developed, and potential related impacts would not occur. As discussed in Section 2.2, Existing Facilities and Disturbance, in 2003, Homestake purchased title to 1,644 acres of BLM-managed land that previously was identified for disposal in the Shoshoe-Eureka RMP. The land sale encompassed all areas of surface disturbance on public lands associated with the currently permitted Ruby Hill Mine, resulting in private ownership of the entire mine site. As a result, existing mine-related impacts to recreation, as described in the Ruby Hill Mine Final EIS (BLM 1997***a***), would continue beyond mine closure.

3.12.3 Cumulative Impacts

The cumulative impact area for recreation and wilderness is presented in **Figure 3.8-1**. Interrelated projects are identified in **Table 2-9**. As discussed above under the No Action Alternative, Homestake purchased title to 1,644 acres of public land in the existing mine area in 2003, representing a long-term loss of public access to these lands for recreation. The proposed mine expansion would contribute incrementally to the loss of public lands available for dispersed recreational activities; however, this loss would be temporary and short-term for all affected public lands with the exception of the portion within the pit expansion area. This area would be restricted for safety reasons and incrementally would add to the long-term loss of public lands for recreation. If approved, the potential future land sale of approximately 400 acres of public land (which would include the proposed pit expansion area) would result in the long-term loss of public access to these lands for recreation. The proposed mine expansion also would result in a temporary incremental increase in demand for dispersed and developed recreational opportunities during the life of the mine.

No direct impacts to wilderness or adverse impacts to wilderness values have been identified as a result of the Proposed Action. As a result, the proposed project would not contribute to cumulative impacts on these resources.

3.12.4 Mitigation and Monitoring

No monitoring or mitigation is recommended for recreation or wilderness.

3.12.5 Residual Adverse Impacts

Residual adverse impacts to recreation would include the long-term loss of access to approximately 25 acres of public lands associated with the pit expansion area. This impact would be considered minimal based on the overall availability of public lands for recreation in the area.

3.13 Visual Resources

The visual resources study area for direct and indirect impacts is the existing Ruby Hill Mine study area (inclusive of the proposed mine expansion areas) as seen from the three KOPs identified for the project. The cumulative impact area incorporates the entire viewshed of the proposed expansion area as seen from overlapping 90-degree angles from each of the KOPs.

3.13.1 Affected Environment

The objectives of the visual resources investigation are to identify and describe visual resources that could be affected by the construction and operation of the proposed expansion. Important visual resources are defined for this study as visually sensitive use areas where the maintenance of the surrounding visual environment is important to people, and unique or unusual landscapes having natural scenic value. The study area includes landscapes where viewers may travel, recreate, or reside, and where existing views potentially may be affected by the proposed expansion.

The visual resources study area for the Proposed Action is defined as the viewshed of the project, or the area from which the project can be seen. This viewshed includes an area bounded by mountain ridges on the east, south, and west and the topographic rise in the Diamond Valley floor approximately 5.5 miles to the north of the project site. A small ridge on the western edge of Eureka serves to screen views of the existing Ruby Hill Mine from town. The existing project facilities are visible from the fairgrounds, from selected residences located along the western edge of town, from scattered residences in the region, and for those who travel around Caribou Hill on Ruby Hill Road.

The BLM utilizes VRM classifications to manage the quality of the landscape by minimizing impacts to visual resources resulting from development activities, while maintaining the effectiveness of all BLM resource programs. In determining VRM class designations, the inventory process considered the scenic value of the landscape, viewer sensitivity to the scenery, and the distance from the viewer to the subject landscape. These management classes identify various acceptable levels of landscape alteration, while protecting the overall visual quality of the region (BLM 1986b). Management classes are broken down into four levels (Classes I to IV), with Class I designated as most protective of the visual resources. The objectives of these classes vary from allowing only very limited activity to allowing major landscape modifications (see **Table 3.13-1**).

Landscape character type is a unit of physiographic area having common characteristics of land forms, rock formations, water forms, and vegetation patterns. The study area is located in the Basin and Range Physiographic Province. Lands within the project area are typical of Basin and Range province landscapes within central Nevada with broad, open basins bounded by prominent north-south trending mountain ranges generally covered by piñon-juniper vegetation. This type of landscape allows for long viewing distances. The project area is located at the extreme southern end of a large alluvial basin (Diamond Valley) and within the undulating foothills of the Fish Creek Range. To the east, the Diamond Mountains rise sharply above the valley and the town of Eureka. The elevation at the site ranges from approximately 6,200 feet to 6,500 feet amsl.

Table 3.13-1
BLM Visual Resource Management Classes

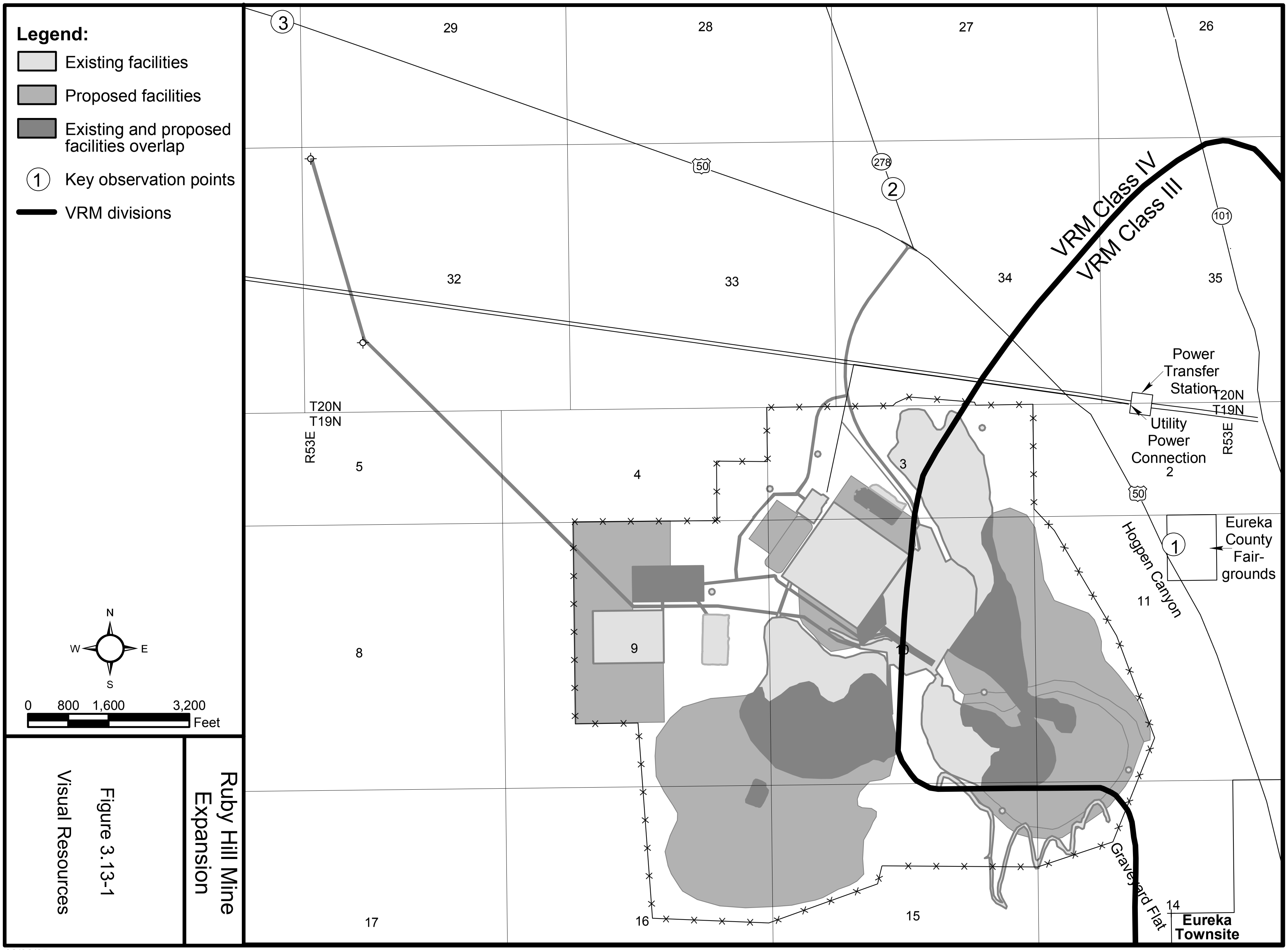
Class	Description
I	The objective of this class is to preserve the existing character of the landscape. This class provides for natural ecological changes; however, it does not preclude very limited management activity. The level of change to the characteristic landscape should be very low and must not attract attention.
II	The objective of this class is to retain the existing character of the landscape. The level of change to the characteristic landscape should be low. Management activities may be seen, but should not attract the attention of the casual observer. Any changes must repeat the basic elements of form, line, color, and texture found in the predominant natural features of the characteristic landscape.
III	The objective of this class is to partially retain the existing character of the landscape. The level of change to the characteristic landscape should be moderate. Management activities may attract attention but should not dominate the view of the casual observer. Changes should repeat the basic elements found in the predominant natural features of the characteristic landscape.
IV	The objective of this class is to provide for management activities that require major modification of the existing character of the landscape. The level of change to the characteristic landscape can be high. These management activities may dominate the view and be the major focus of viewer attention. However, every attempt should be made to minimize the impact of these activities through careful location, minimal disturbance, and repeating the basic elements.

Source: BLM 1986b.

Surface soils and rocks in the area generally range from buff to grayish-tan hues of light-to-medium value. Vegetation, which consists mainly of piñon pine, juniper, sagebrush species, and sparse grasses, is uneven, with patches of soil exposed due to access roads and other disturbances. Colors of vegetation in the project area include muted gold, rust, grey-green, and medium olive. Structures in the project vicinity include the tan-colored buildings at the existing Ruby Hill Mine, several weathered wooden headframes associated with historic mining, and a group of blue-grey corrugated metal buildings located on Ruby Hill. These structures are geometric in form. Cultural landforms in the project vicinity include the existing East Waste Rock Disposal Area, heap leach pad, and West Waste Rock Disposal Area, roadway grades in steeper areas, and several sand and gravel operations on the valley floor. The existing East and West waste rock disposal areas have been contoured to repeat the natural landforms of the region and colored to repeat the basic colors of native grasses, while the heap leach pad and remaining sand and gravel and roadway landforms in the vicinity are geometric in form.

The project area lies partly within a VRM Class III landscape (see **Figure 3.13-1** and **Table 3.13-1**). The western portion of the project area is identified as a VRM Class IV area. No VRM Class I and a few VRM Class II landscapes exist within the BLM Battle Mountain District; most of the planning area has been designated as Class IV (BLM 1983).

In order to assess the degree of visual contrast that would result from implementation of the Proposed Action, KOPs were selected from which changes to the characteristic landscape could be compared. KOPs typically are chosen along commonly traveled routes or at other likely observation points (BLM 1986b). For



Ruby Hill Mine Expansion

Figure 3.13-1

Visual Resources

02/02/05

the purposes of this analysis, three KOPs were chosen that provide views toward the project area. These are the same KOPs used in the Ruby Hill Project Final EIS (BLM 1997); however, visual exposure of the East Waste Rock Disposal Area from KOP #1 has increased since that time as a result of BLM piñon/juniper thinning. In addition, the existing East Waste Rock Disposal Area, originally proposed as a 35-million-ton facility in the Final EIS, subsequently was constructed as a 25-million-ton facility per the ROD. As a result, the height of the existing facility is lower than projected in the Final EIS analysis. The three KOP sites are located at: 1) the Eureka County Fairgrounds, 2) SR 278 near the intersection with U.S. Highway 50, and 3) U.S. Highway 50 near its intersection with Collingwood Lane (see **Figure 3.13-1**). Near the intersection of SR 278 and U.S. Highway 50 is the new visitor information pull-out and rock monument. This facility provides an excellent view of the existing Ruby Hill Mine and contains interpretive information about the processes of mining. This viewpoint is very near, and, essentially similar to, the view characteristics of KOP #2.

KOP #1 is located within the Eureka County Fairgrounds parking area, approximately 0.4-mile east of the existing East Waste Rock Disposal Area, the nearest edge of the project area. From KOP #1, views of the project area are to the west, over U.S. Highway 50. The project area is in the foreground/middleground viewing zone (ranging from 0.4 to 2.3 miles), against the backdrop of the tree-covered Mountain Boy Range. Scattered piñon pine and juniper trees to the west of U.S. Highway 50 partially obscure views of the project area and tend to emphasize the existing waste rock disposal area landforms.

KOP #2 is located along SR 278, 0.5-mile north of its intersection with U.S. Highway 50. From this KOP, the nearest edge of the project lies approximately 1.2 miles to the south-southeast in the foreground/middleground viewing zone. Project elements range from 1.1 to 2.8 miles from this view point. The Fish Creek Range and Prospect Peak landforms are covered with scattered piñon-juniper vegetation and constitute the backdrop to the existing Ruby Hill Mine. The project area landform is inclined toward the viewer. The East and West waste rock disposal areas and heap leach pad generally repeat the landforms of the mountains in the backdrop. Wooden and steel electrical structures parallel the northern perimeter of the project area and present relatively strong horizontal and vertical elements between the viewer and project area.

KOP #3 is located approximately 2.5 miles northwest of the project area, at the intersection of U.S. Highway 50 and Collingwood Lane. The project area is situated in the foreground/middleground distance zone against a backdrop that consists of the Diamond Mountains and Prospect Peak. Project elements range from 2.1 to 4.3 miles from this view point. From this vantage point, the project area is viewed on an alluvial bench, above the valley floor, and contains patches of piñon-juniper vegetation. Residences along Frontier Road are visible in the foreground, and strips of bare ground, a result of county gravel pits, are visible in the foreground and near the project area. The project area landform is inclined toward the viewer. The East and West waste rock disposal areas and heap leach pad generally repeat the landforms of the backdrop. Wooden and steel electrical structures parallel the northern perimeter of the project area and present relatively strong horizontal and vertical elements between the viewer and project area.

3.13.2 Environmental Consequences

Visual impacts are assessed in accordance with standard BLM VRM contrast rating principles (BLM 1986b). The contrast rating process is used to systematically identify the nature and degree of visible modification to the landscape that would occur as a result of a Proposed Action. The degree of contrast is then compared to visual resource management guidelines for the area to determine the level of impact or compatibility. Environmental impacts to visual resources would occur if the Proposed Action could exceed the BLM VRM objectives for public lands within the project area.

3.13.2.1 Proposed Action

The extent to which the Proposed Action would affect the visual quality in the project area would depend on the amount of visual contrast created between the proposed expansion facilities and the existing landscape elements (form, line, color, and texture) and features (land and water surface, vegetation, and structures). The degree of contrast is rated based on the standardized Visual Contrast Rating System for each element and feature. Actions that exceed visual management objectives may be required to reduce their overall contrast. Assessing the Proposed Action's contrast in this manner indicates the severity of potential impacts and guides the development of mitigation measures, if needed, so the VRM objectives would be met.

Major elements associated with the proposed mine expansion that would have the potential to contrast with the characteristic landscape include the pit expansion, East and West waste rock disposal facility expansion areas, the heap leach pad expansion, and the newly proposed soil borrow area and growth media stockpile.

As shown in **Figure 3.13-1**, the eastern half of the mine site, which includes the East Waste Rock Disposal Area and pit expansion areas, would occur within a VRM Class III area. Under Class III guidelines, visual modifications are permitted to attract attention, but not to dominate the view. The remainder of the proposed expansion areas occur within a Class IV area where changes to the landscape are allowed to dominate views and be a major focus of viewer attention.

The expansion areas for the waste rock disposal facilities and heap leach pad would be the most visually prominent features of the Proposed Action; the pit expansion would be obscured by these facilities and surrounding terrain in views from the east, north, and northwest. Natural screening provided by the landforms along the west and northwest sides of Eureka would shield views of the mine elements from the townsite.

Expansion of the East and West waste rock disposal areas would disturb irregularly shaped areas. These facilities would reach a maximum height of approximately 120 and 400 feet, respectively, (as measured from original ground level at their highest elevations) at the peak of mining operations. The waste rock disposal areas would be constructed in lifts of approximately 50 feet in height. As described in Section 3.2.4, Expansion of Waste Rock Disposal Areas, the waste rock disposal areas on the visually sensitive north and east sides would be regraded to approximately 3H:1V slopes as soon as possible after sections of the disposal areas have been constructed, thereby minimizing the extent and duration of bench-like slopes. In addition, as discussed in Section 2.3.14, Applicant-committed Environmental Protection Measures, the slopes of the expanded waste rock facilities would be shaped to blend with the surrounding topography to the extent possible to further minimize visual effects.

As discussed in Section 2.3.6.1, Heap Leach Design and Construction, the heap leach pad expansion would be constructed in successive 20- to 30-foot lifts and would reach a height of approximately 140 feet above the original ground level. The overall operational slope would be approximately 3H:1V.

The following discussion describes in more detail those components of the Proposed Action that would result in changes to the visual landscape as viewed from the three KOPs shown in **Figure 3.13-1**.

The Proposed Action, as viewed from KOP #1, would contrast with the predominant forms, lines, colors, and textures of landforms found in the surrounding characteristic landscape. The photograph in **Figure 3.13-2** shows the existing visual condition. Two simulations, **Figures 3.13-3** and **3.13-4**, show the visual characteristics of the Proposed Action immediately after mining and approximately 10 years after mining, respectively. The visual contrasts of the waste rock areas during operations and as shown in the post-mining simulation would be reduced to a degree by Homestake's implementation of concurrent reclamation during operations. Project elements such as the expanded West Waste Rock Disposal Area, expanded heap leach pad, new soil borrow area, and existing processing facilities and roads would not be visible behind the East Waste Rock Disposal Area when viewed from this KOP. The top of the expanded West Waste Rock Disposal Area would be visible. For approximately 10 years after its construction, the sparsely vegetated waste rock disposal area would contrast strongly with colors found in the characteristic landscape. The visible face of the expanded East Waste Rock Disposal Area would consist of a mosaic of light to moderately colored hues as a result of the varied origin of the raw rock materials in these slopes. Bright sunlight during the morning and early afternoon would emphasize these color differences and could create reflective glare from the angular mine rock materials. There also would be a slight texture contrast between the bare surface of the expanded East Waste Rock Disposal Area and the vegetation textures, patterns in the natural landscape, and the sky. Reseeding and plantings of woody shrub seedlings is expected to result in a stippled appearance of vegetation along the face of the waste rock disposal area for approximately 10 years.

Changes to the surrounding characteristic landscape as a result of the Proposed Action would be noticeable in views from KOP #2. The photograph in **Figure 3.13-5** shows the existing visual condition. Two simulations, **Figures 3.13-6** and **3.13-7**, show the visual characteristics of the Proposed Action immediately after mining and approximately 10 years after mining, respectively. The visual contrasts of the waste rock areas during operations and as shown in the post-mining simulation would be reduced to a degree by Homestake's implementation of concurrent reclamation during operations. The expanded East and West waste rock disposal areas and expanded heap leach pad would result in moderate contrasts with existing land forms, and the lack of mature vegetation on these features would result in moderate color contrasts. Prospect Peak and the Fish Creek Range would continue to be visible in views from this KOP. Contrasts in line would be considered weak as the proposed mine expansion facilities would somewhat resemble natural lines and textures in the existing mine vicinity. Outdoor night lighting at the existing process plant and expanded heap leach pad would attract the attention of south-bound motorists on SR 278. The effects of night lighting currently are, and would continue to be, minimized through the use of shielding and directing lights downward when possible (see Section 2.3.14, Applicant-committed Environmental Protection Measures).

Few major contrasts are expected to result from the Proposed Action when viewed from KOP #3, partially as a result of the longer viewing distance. The photograph in **Figure 3.13-8** shows the existing visual condition. Two simulations, **Figures 3.13-9** and **3.13-10**, show the visual characteristics of the Proposed Action immediately after mining and approximately 10 years after mining, respectively. The visual contrasts of the waste rock areas during operations and as shown in the post-mining simulation would be reduced to


Figure 3.13-2
KOP 1
Existing Condition


Figure 3.13-3
KOP 1
Post-mining


Figure 3.13-4
KOP 1
Post-reclamation


Figure 3.13-5
KOP 2
Existing Condition


Figure 3.13-6
KOP 2
Post-mining


Figure 3.13-7
KOP 2
Post-reclamation

Figure 3.13-8
KOP 3
Existing Condition

Figure 3.13-9
KOP 3
Post-mining

Figure 3.13-10
KOP 3
Post-reclamation

a degree by Homestake's implementation of concurrent reclamation during operations. Visible mining elements would include both expanded waste rock disposal areas and the expanded heap leach pad. The proposed mine expansion would be viewed against a backdrop formed by Prospect Peak and the Fish Creek Range. The pit expansion would not be visible as a result of the heap leach pad, which would contrast moderately with colors of the characteristic landscape during the life of the mine, but only weakly with respect to form and line. At this viewing distance, the texture of these mine elements would contrast moderately with that of the characteristic landscape. Outdoor night lighting at the mine would be visible from residences located along Frontier Road and would attract the attention of east-bound motorists on U.S. Highway 50. The effects of night lighting would be minimized through implementation of environmental protection measures, as discussed above.

Dust plumes originating from the mine area occasionally could be visible for distances of several miles. Dust could be generated as a result of blasting in the pit area, vehicular traffic on haul roads, and by the dumping of waste rock. As discussed in Section 2.3.14, Applicant-committed Environmental Protection Measures, dust control measures (e.g., application of water and dust-inhibiting agents) would be implemented to minimize the generation of fugitive dust.

Overall, the proposed mine expansion would contrast with the existing forms, lines, and colors of the surrounding characteristic landscape. Those portions of the Proposed Action that lie outside the VRM Class III area would be consistent with the VRM Class IV objectives. Construction of the expanded East Waste Rock Disposal Area would be consistent with VRM Class III objectives.

During mine closure, the expanded heap leach pad would be graded to eliminate the benches between lifts, reduce the side slopes to an approximate 3H:1V grade, and to round off the heap edges to approximate more natural contours. Mine access roads, which are constructed of alluvium, would be ripped and reseeded, and buildings and ancillary facilities would be removed, as appropriate, and their foundations ripped and reseeded.

Assuming the proposed reclamation program is successful, the visual contrast resulting from the Proposed Action would be reduced over time. Color and texture increasingly would blend more with the natural landscape. Revegetation of the faces of the expanded waste rock disposal areas and the expanded heap leach pad would reduce visual contrasts with surrounding vegetation. Vegetation over the long-term would increasingly blend with the color and texture of the existing natural landscape, reducing visual impacts of the Proposed Action over time as viewed from each of the three KOPs.

3.13.2.2 No Action Alternative

Under the No Action Alternative, additional disturbance associated with the expansion of the open pit, waste rock disposal areas, and heap leach pad would not occur. The existing visual environment would remain essentially unchanged in the short term; however, Homestake would be required to continue to reclaim surface disturbances associated with the currently permitted Ruby Hill Mine as discussed in the Ruby Hill Mine Final EIS (BLM 1997a).

3.13.3 Cumulative Impacts

The cumulative impact area for visual resources is presented in **Figure 3.13-11**. Interrelated projects are identified in **Table 2-9**. The proposed mine expansion incrementally would add to the existing visual impacts in the cumulative impact area. The existing visual impacts primarily are related to the existing Ruby Hill Mine and ongoing mineral exploration in the mine vicinity; mine-related impacts are discussed in detail in the Ruby Hill Mine Final EIS (BLM 1997a). Assuming successful reclamation of the mine expansion facilities, cumulative impacts (non-conformance in the VRM Class III area) would be temporary in nature. The visual impacts associated with the Norse Windfall Mine, Windfall Venture Mine, and Jewell Canyon exploration area currently are screened from view from the KOPs by the mountainous topography south of the existing Ruby Hill Mine and, therefore, would not have a cumulative interaction with the proposed mine expansion.

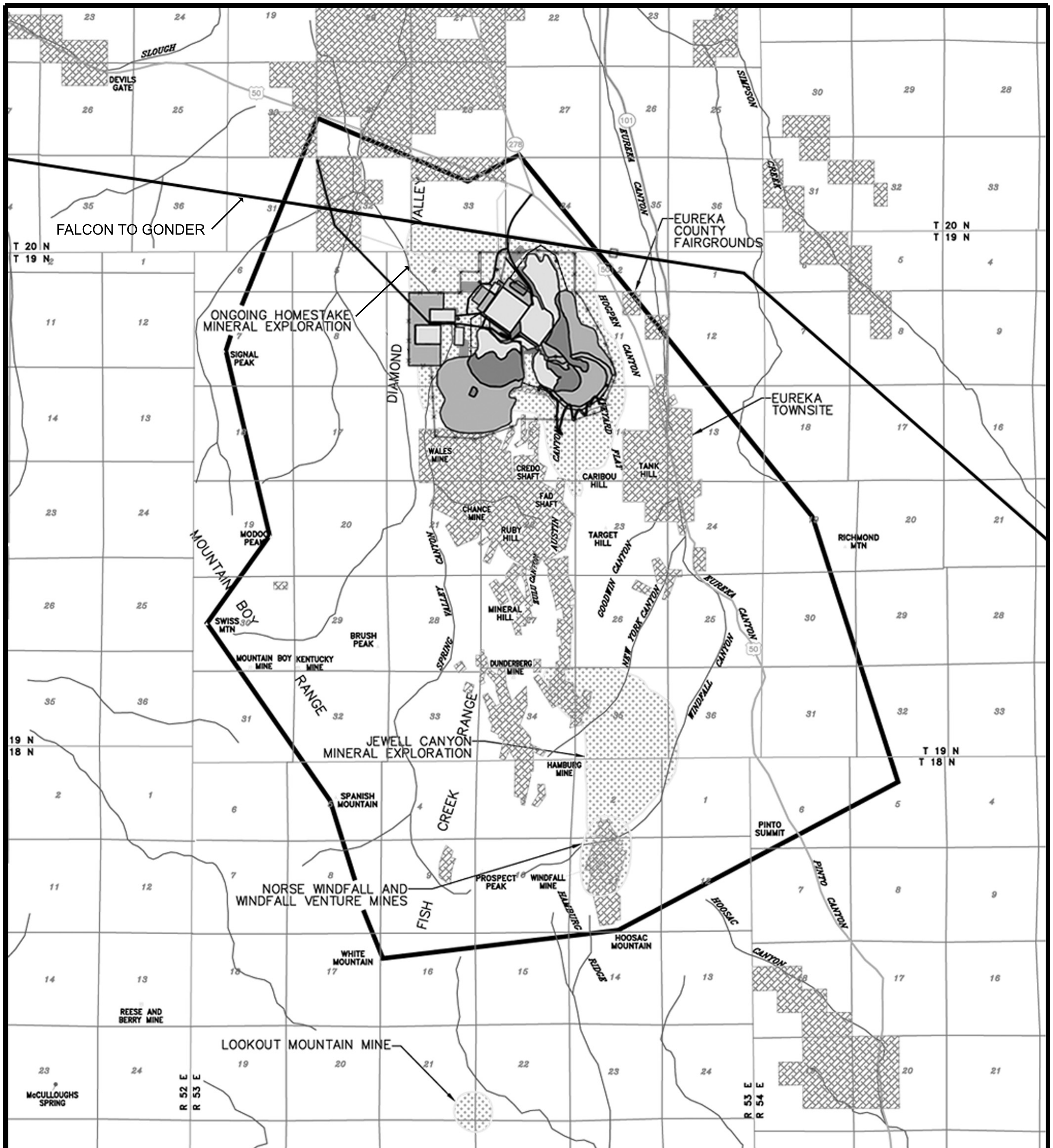
It is anticipated that future mining at the Ruby Hill Mine would utilize underground mining methods, waste rock would be concurrenlty backfilled, and existing facilities would be used for ore processing. As a result, it is assumed that additional mining-related visual impacts would be limited to changes in the configuration of the heap leach facility. Although insufficient information is available at this time to analyze the cumulative interaction with the Proposed Action, the extent of the change and degree of associated visual impacts would be analyzed under a future environmental analysis.

3.13.4 Mitigation and Monitoring

During active mining, little can be done to reduce line and color contrasts of disturbed lands without unduly interfering with mine operations. No effective monitoring or mitigation has been identified that would minimize the extensive areas of landforms that would persist indefinitely beyond the active life of the mine.

3.13.5 Residual Adverse Impacts

Proposed reclamation should notably reduce color and textural contrasts over the long term.



Legend

- Past disturbance
- Present disturbance
- Existing facilities
- Proposed facilities
- Existing and proposed facilities overlap
- Cumulative assessment boundary
- Falcon to Gonder (past disturbance)

N E S W

0 1 2 Miles

Ruby Hill Mine Expansion

Figure 3.13-11

Cumulative Impact Area for Visual Resources

10/30/04

3.14 Noise and Blasting Vibrations

3.14.1 Affected Environment

The noise resources study area for direct and indirect impacts includes the sensitive receptors (i.e., Eureka County High School, residents located in the western portion of the Town of Eureka, and the Eureka County Fairgrounds) within proximity of the existing Ruby Hill Mine study area, which includes the proposed mine expansion area. The cumulative impact area includes the area within a 1.5-mile radius of the town of Eureka and the Eureka County Fairgrounds. The study and cumulative impact areas for vibration include the sensitive receptors in the town of Eureka (i.e., historic buildings and residences located in the western portion of town).

3.14.1.1 Noise

The State of Nevada and Eureka County do not have ordinances for evaluating noise impacts associated with mining operations. The USEPA has adopted the day-night average sound level (L_{dn}) as the rating method used to describe community noise. L_{dn} is a 24-hour, time-weighted, average noise level in dBA that adds 10 dBA to noise measured between 10:00 p.m. and 7:00 a.m. This adjustment is an effort to account for the increased sensitivity to nighttime noise events. The USEPA recognizes an L_{dn} of 55 dBA as a goal for residential areas "to protect public health and welfare with an adequate margin of safety (USEPA 1974)." However, this is not a regulatory requirement. This threshold is considered the point that, if exceeded, people could become irritated with such sounds. The State of California's Model Community Noise Control Ordinance recommends an outdoor maximum noise level (L_{max}) of 70 dBA for brief, impulse-type noise sources such as blasting; Nevada has no such ordinance.

The nearest receptors to the proposed expansion are the residents located in the western portion of the town of Eureka and Eureka County High School. The high school is located 0.7-mile southeast of the existing Ruby Hill Mine, along a small ridge overlooking the town of Eureka. Modular classrooms to the rear of the building are within line-of-sight of the southern portion of the mining area. Residences in the northwestern portion of Eureka would be closer to the proposed expansion area, but are on the opposite (eastern) side of this ridge. Residences located south of the high school (i.e., on the west side of Tank Hill) lie within line-of-sight of portions of the proposed expansion area. The Eureka County Fairgrounds are located approximately 0.25-mile east of the proposed expansion area and can be considered a sensitive noise receptor during weddings, poetry readings, and other activities requiring serenity and quiet.

The existing mine site and proposed expansion area are located in a rural area where background noise levels would be expected to be quite low, except when dominated by noise from traffic and wind. In June of 1995, noise level measurements were conducted by Brown-Buntin Associates in the project area and within the town of Eureka. This was done to determine existing background noise levels, as well as noise trends throughout the day.

Results of the background noise level measurements indicated that hourly-average noise levels along the ridge on the western edge of Eureka generally ranged between 39 and 59 dBA, L_{eq}, during the daytime hours (7:00 a.m. to 10:00 p.m.), and 35 to 48 dBA, L_{eq}, during the nighttime hours (10:00 p.m. to 7:00 a.m.). Noise measurements taken at the Minoletti Ranch (located approximately 1.5 miles northwest of the existing mine site) indicate that background noise levels ranged between 40 and 60 dBA, L_{eq}, during daytime hours and 29 and 52 dBA, L_{eq}, during nighttime hours. It should be noted that these noise measurements were conducted during a period of extensive exploratory drilling within the project area that included 24-hour core sample drilling; thus, true background levels may be lower.

Based on the noise level measurements, wind was determined to be a major contributor to noise at the monitoring sites. The data indicated that when wind speeds exceeded 10 m/s (approximately 22 mph), background noise levels were defined by the wind.

Traffic also is a major noise source in the town of Eureka, with traffic volumes in the area being dominated by vehicles on U.S. Highway 50. Traffic data compiled by NDOT (1994) indicate that U.S. Highway 50 through Eureka carried an average of approximately 1,700 vehicles per day in 1993. Modeling of highway traffic noise levels was based on average daily traffic volumes within the town of Eureka. The modeling results indicated that noise levels at approximately 200 feet of U.S. Highway 50 were approximately 55 dBA, L_{dn} (Brown-Buntin Associates 1995).

The noise assessment by Brown-Buntin Associates (1995) predicted that noise levels produced during initial mining at the existing Ruby Hill Mine only marginally would exceed the 55 dBA recommended limit.

3.14.1.2 Blasting Vibrations

There are no mandatory federal or state standards for vibration resulting from mining operations. Industry standards, as published in the Federal Register, Part III, Department of the Interior, March 8, 1983, are used for the purposes of this analysis.

Vibrations are measured as acceleration, and are expressed in inches per second. Vibration levels potentially capable of producing cosmetic or perceptible structural damage are defined as ranging from 0.5 to 2.0 inches per second. Structures can be categorized according to three predicted thresholds for sustaining damage: 0.5, 1.0, and 2.0 inches per second. While a vibration limit of 2.0 inches per second is adequate for sound, modern buildings, 1.0 and 0.5 inch per second are more conservative limits for older and historic buildings, respectively, where building materials and methods may be more susceptible to damage.

Although blasting activities associated with mining generally are perceived to be one instantaneous explosion, they actually are a series of smaller, sequential explosions, referred to as delays. As a result, less noise and ground vibration are generated. For example, instead of setting off one 600-pound blast, a properly delayed series of four, 150-pound blasts substantially would reduce vibration at sensitive receptors. Blasting effects can be further controlled by varying the amount of explosive, the type of delay, the delay sequence, and even the type of explosive.

The literature reveals that natural environmental forces are the primary factor in the production and widening of structural cracks and building damage. Oriard (1989) compared structural damage due to temperature and humidity to that from blasting vibration and found the former factors to be much more likely causes of structural damage. Truck traffic on local roadways and sonic booms from jets also can generate substantial vibration. Thus, it is important to determine the magnitude of blast-produced vibration at the sensitive receptors, and to assess the structural susceptibilities, in order to determine the risk of blast-induced damage.

The nearest blast vibration-related sensitive receptors to the proposed expansion are the structures located in the town of Eureka. Many of the buildings in the town are on the NRHP, having been constructed in the late 1800s. A vibration analysis for the existing Ruby Hill Mine was undertaken by Golder Associates, Inc. (Golder) (1996a). It included a detailed survey of structures in the town of Eureka and an assessment of their sensitivity to potential blast vibrations. In their survey of building conditions, Golder categorized the buildings according to their susceptibility to vibrational damage (i.e., building materials and maintenance status). The historic buildings, having been constructed of rock and timber, were found to be more sensitive to cosmetic and structural damage than the newer buildings, and were thus assigned vibration limits of 0.5 inch per second. Structures in good repair and not constructed with archaic building materials were assigned limits of 1.0 inch per second. New, sound buildings were assigned limits of 2.0 inches per second. A summary of the structures surveyed and their estimated vibration limits is presented in the Ruby Hill Project Final EIS (BLM 1997***a***).

In 2004, Golder (2004) again reviewed the potential for blasting vibration-related effects on sensitive receptors in the vicinity of the Ruby Hill Mine site based on vibration monitoring data collected during previous mining in the existing West Archimedes pit and recalculation of potential risk levels using new blasting parameters. Vibration monitoring data were collected from three monitoring locations that were established near the Ruby Hill Mine and the town of Eureka. Golder reviewed the continuous monitoring data in relation to documented times of the mine blasts. Based on this review, Golder determined that the 25 data points collected between 1997 and 2002 that exceeded the conservative 0.25 inches per second action level occurred at times other than the documented blast times for a specific day (10 of the data points) or on days when no blasting occurred (15 of the data points) and, as a result, were non-mine-related.

For the review, Golder (2004) repeated the original risk calculations (Golder 1996b); however, the new parameters for the 2004 review of the vibration analysis included moving the blast locations 1,400 feet to the east and 800 feet to the south. Additionally, the explosive weight used in the algorithm was increased from 200 to 275 pounds. The updated review found that even when raising the explosive weight to 400 pounds, the maximum probability of cosmetic damage from a single blast event to the most susceptible structure would be less than one in 50 million.

3.14.2 Environmental Consequences

3.14.2.1 Proposed Action

<u>Noise</u>

Noise levels associated with the initial construction phase of the Proposed Action would be temporary and would vary widely during the day. Mine expansion activities that may generate noise perceptible at nearby sensitive receptors would include the excavation of overburden in the pit expansion area, construction of the expanded waste rock disposal areas, excavation of the soil borrow area, construction of the expanded heap leach pad, the operation of heavy mobile equipment, and the movement of mine-related traffic to and from the mine site. Noise levels associated with construction may be substantial in some areas, but generally are expected to be lower than those during initiation of active mining operations at the existing Ruby Hill Mine. Construction-related noise levels are only briefly expected to adversely affect nearby sensitive receptors due to their relatively short duration, and due to the limitation of construction activities to daytime hours (7:00 a.m. to until 7:00 p.m.).

After the initial construction phase, the propose mine expansion is expected to operate 24 hours per day, 365 days per year during the projected 7-year life of the mine. Although a detailed blasting schedule has not been completed, it is expected that blasting within the open pit expansion area would occur infrequently (one to a few times each day) and only during daylight hours (see Section 2.3.2.4, Drilling and Blasting).

The Proposed Action would contain several discrete components that would contribute to the cumulative noise environment. Those components would include drilling into rock formations using two rotary hammer-type drills; excavation of rock from the open pit expansion area using a bulldozer and wheeled loaders; transporting waste material from the pit expansion area to the expanded waste rock disposal areas using haul trucks; processing of ore at the existing crushing, grinding, agglomeration circuit using existing primary, secondary, and tertiary crushers and screen decks; and transport of crushed ore via existing and extended conveyors from the crushers in the crushing, grinding, agglomeration circuit to the expanded leach pad. The drilling of blast holes could occur continually for up to 24 hours a day, and it is assumed that the bulldozer and wheeled loaders operating within the expanded pit also would operate continually. Uncrushed ore also would be transported to the expanded waste rock disposal areas with 100- to 200-ton haul trucks and spread with bulldozers. It is assumed that approximately 5 to 15 haul truck trips to the expanded waste rock disposal areas would occur each hour.

Brown-Buntin Associates (1995) used the Environmental Noise Model for projecting noise levels associated with the existing Ruby Hill Mine. A summary of their analysis and their report are included in the Ruby Hill Project Final EIS (BLM 1997). The model included input factors such as topography, meteorology, distance, and noise levels from equipment similar to that expected to be used under the proposed mine expansion to predict noise levels at given distances from the mine site. Several models were run assuming various wind effects that could result in either mine noise being carried farther or being attenuated. In their initial Environmental Noise Analysis, Brown-Buntin Associates (1995) demonstrated that of the two mining stages (initial mining operations and progressed mining operations), initial mining operations would result in higher noise levels at nearby sensitive receptors. This is because noise models representing initial mining operations assumed no shielding of noise emanating from the open pit as equipment would be working at or near the surface. For the progressed mining scenario, many of the mine noises were assumed to emanate from deeper within the pit, thereby preventing the direct transmission of noise to nearby sensitive receptors.

The results of the modeling revealed that the combined noise levels from operation of the currently permitted Ruby Hill Mine would be perceptible at nearby sensitive receptors, but generally would remain below 55 dBA, L_{eq}, the level identified for protecting public health and welfare with an adequate margin of safety. These standards are consistent with those of the USEPA for outdoor noise in residential areas. Noise levels in the town of Eureka as a result of mining were predicted to be between 30 to 35 dBA, L_{eq}, under no wind conditions during initial mining operations and, therefore, would not be perceptible above existing ambient noise levels. In general, the extent of the 55 dBA noise contour was found to be limited mostly to the confines of the existing Ruby Hill Mine site, except when northwesterly winds reached approximately 10 m/s (22.5 mph), in which case, noise levels in excess of 55 dBA, L_{eq}, were projected to be perceptible throughout the northern portion of the town of Eureka. However, at 10 m/s, noise levels begin to be dominated by the wind itself. Under these conditions, mining operation noise levels would be audible; however, it is anticipated that noise resulting from the wind would range between 45 and 50 dBA, L_{eq}. Although the maximum impact to sensitive receptors in the town of Eureka was modeled for these conditions (i.e., with northwest wind of 10 m/s), the frequency of northwest winds at this speed or greater in the project area has been measured to be one-hundredth of one percent for the period January 1, 2002, through December 31, 2003 (see Section 3.1, Air Quality). Based on the modeling results, the low frequency of observed winds in the mine area at 10 m/s from the northwest, and Homestake's commitment to continue using blasting procedures to help ensure threshold noise levels would not be exceeded as discussed in Section 2.3,14, Applicant-committed Environmental Protection Measures, potential noise impacts to sensitive receptors in the town of Eureka would be minimal.

Within the project area, predominant winds are from the south (see Section 3.1, Air Quality), and typically would not serve to convey mine expansion-related noises toward the town of Eureka. In Brown-Buntin Associates' *1995 Environmental Noise Analysis*, modeling was performed for initial mining operations at the existing Ruby Hill Mine with 10-m/s southerly winds. Noise levels under this scenario were expected to exceed 55 dBA, L_{eq}, at the Eureka County Fairgrounds to the northeast of the mining site, and could interfere with the enjoyment of some of the more "quiet" uses such as poetry readings and wedding receptions, when present. However, this was not considered a substantial impact under previous mining operations, and would not be considered a substantial impact under the proposed mine expansion, given the rarity of these events coinciding with winds of this speed from this direction. In addition, as discussed in Section 2.3.14, Applicant-committed Environmental Protection Measures, Homestake has committed to minimize mine expansion-related noise during noise sensitive activities at the fairgrounds and high school.

Atmospheric effects such as temperature inversions also can increase noise levels as they can serve to reflect soundwaves directed toward the sky, toward the ground. Inversions occur most frequently at night and in the early morning when winds are absent. In the Eureka area, inversions occur primarily during winter months (see Section 3.1, Air Quality). Homestake has committed to avoid blasting between 7:00 p.m. and 7:00 a.m. as discussed in Section 2.3.14, Applicant-committed Environmental Protection Measures.

According to noise models for progressed mining operations, noise levels in excess of 55 dBA, L_{eq}, would be contained entirely within the mine site and would not be perceptible by nearby sensitive receptors (Brown-Buntin Associates 1995). Further, winds were not expected to substantially convey noises generated at the mine site toward known sensitive receptors.

It should be noted that under the scenarios described above, noise levels in excess of 40 dBA, L_{eq}, would not be expected at residences near the Minoletti Ranch, located northwest of the mine site. Thus, mine-related noise would not be noticeably perceptible above existing average hourly noise levels at these receptors.

In follow-up to the initial noise modeling program, Brown-Buntin Associates (1996) modeled noise generated from test blasts within the mine site in order to predict noise levels for the original Ruby Hill Mine. Maps depicting blasting noise contours were included in the Ruby Hill Project Final EIS (BLM 1997***a***). Air blast noise levels were monitored at sites between the West Archimedes Pit location (at ground level) and sensitive receptors to the southeast. The predicted L_{max} expected in Eureka under conditions of no wind was

55 dBA. Blasting noise was not expected to exceed 70 dBA within the town when modeled for northwest winds of 5 m/s (11.3 mph). With northwest winds of 10 m/s, modeling results indicated that the 70 dBA contour would extend into the northernmost portion of town. This worst-case scenario, however, is extremely unlikely for the reasons described previously. Consequently, substantial noise impacts from blasting would not be expected to occur.

As during initial construction, noise levels from closure and reclamation activities would be short-term in nature and would be of minor consequence relative to noise levels associated with mining operations. Following the completion of mine closure activities, mine expansion-related noise impacts at nearby sensitive receptors such as the town of Eureka would cease.

Blasting Vibrations

A computerized risk analysis was performed by Golder (1996a) to determine the potential for vibration damage to buildings in the Eureka area as a result of blasting activities at the original Ruby Hill Mine. In running the risk analyses, Golder assumed three different levels of explosive charge (200, 500, and 1,000 pounds per delay), detonated at the location of the open pit nearest to town. The risk analysis included 10,000 blast vibration scenarios. For each of the 79 structures surveyed in Eureka, damage thresholds were determined. The results indicated that the probability of cosmetic cracking from blasting for all of the 79 structures would be less than 0.1 percent if 200 pounds of explosive (or less) per delay were used. Only four structures were found to exceed a 0.1 percent chance of sustaining cosmetic damage at 500 pounds per delay. These structures were the Eureka jail/justice facility, the ambulance building, and the state highway office and storage shed.

Geophysical testing to predict the effects of blasting vibrations in association with the original Ruby Hill Mine was performed by Golder (1996b). The testing program consisted of detonating charges of varying weights and measuring geologic response with vibration recording instruments. These instruments were established at eight locations between the location of the existing open pit and the town of Eureka. Charge weights ranged between 2-pound, single hole detonations and 150-pound, delayed multiple hole detonations, and were detonated near the eastern edge of the existing pit location. Results of the testing program were used to statistically determine whether vibrations resulting from blasting at the original Ruby Hill Mine open pit would exceed vibration tolerances of buildings in the Eureka area. Risk analysis was performed for each of the inventoried structures using the scaled distance method to calculate the probability of exceeding each structure's vibration threshold. The likelihood that any one structure in Eureka would be affected by any one blast was found to be less than one in a trillion. The likelihood of damage to any structure over the life of the original mine (estimated to total approximately 10,000 blasts) was determined to be less than one in 100 million. These probabilities were stated by Golder to be "indistinguishable from zero." Subsequent review of blasting vibration-related effects by Golder (2004), which included moving the blast locations to the proposed mine pit expansion area and using blasting weights of 200 to 275 pounds, found that even when raising the explosive weight to 400 pounds, the maximum probability of cosmetic damage to the most susceptible structure would be less than one in 50 million (or well below 0.1 percent). In addition, as described in Section 2.3.14, Applicant-committed Environmental Protection Measures, Homestake has committed to reinitiate vibration monitoring in Eureka, notify the BLM if blasting-related vibrations exceed the established threshold, and modify blasting practices to prevent recurrence.

3.14.2.2 No Action Alternative

Under the No Action Alternative, the proposed mine expansion would not be developed and related potential noise and vibration impacts would not occur. Under this alternative, there would be no potential blasting-related impacts, as active mining at the existing Ruby Hill Mine has been completed. Noise-related effects would be limited to activities associated with ongoing processing of ore and reclamation. As a result, potential noise effects would be lower than during active mining and would cease following final closure and reclamation.

3.14.3 Cumulative Impacts

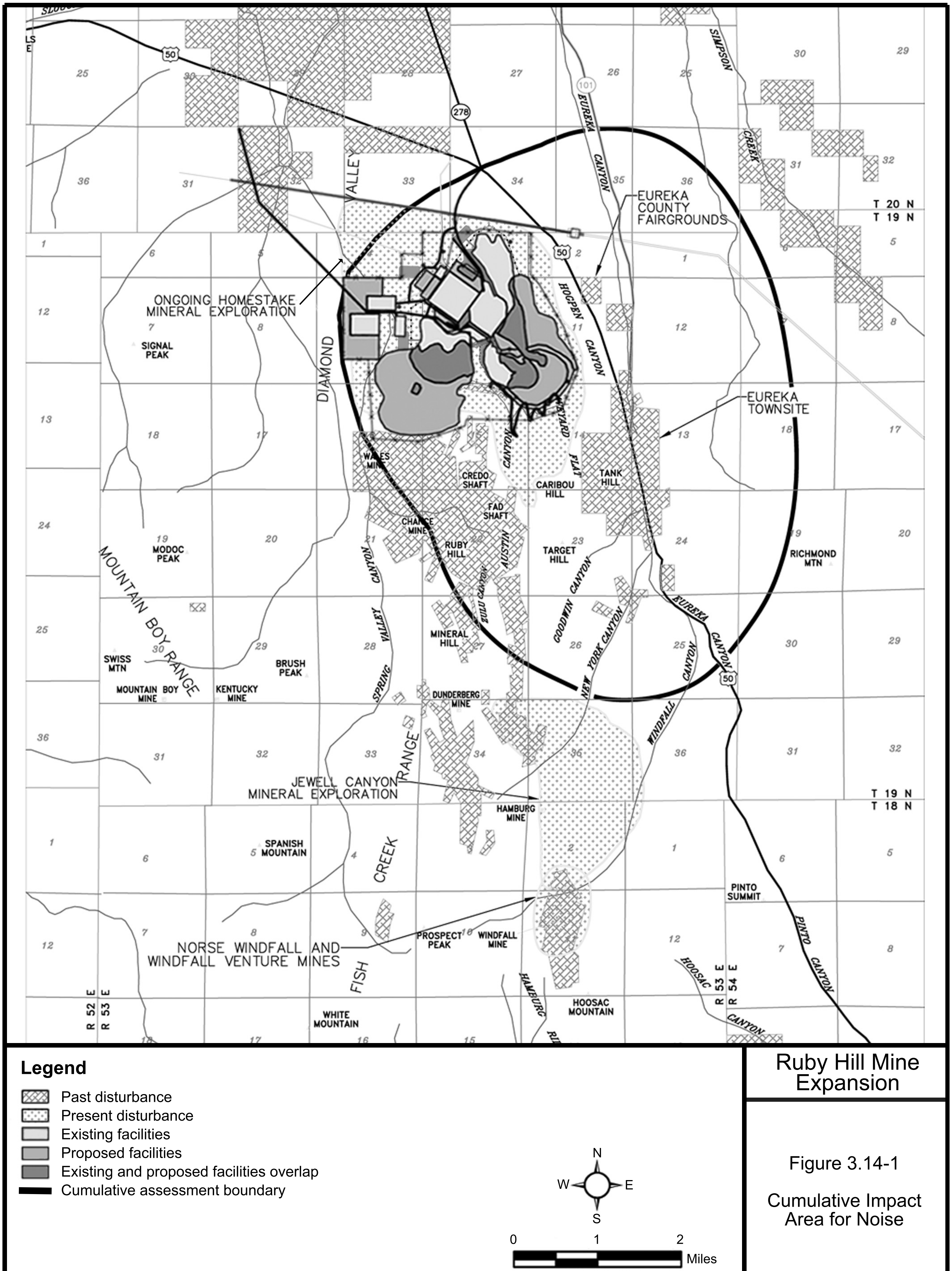
The cumulative impact area for noise is shown on **Figure 3.14-1**. Interrelated projects are identified in **Table 2-9**. The cumulative impact area for noise represents the maximum distance that noise in excess of 55 dBA, L_{eq}, could travel from a source (or sources) with the aid of a 10-m/s wind. Noise associated with ongoing mineral exploration in the cumulative effects area would be relatively minor, of short duration, and, therefore, of minor consequence. The character of noises and blasting vibrations generated by operations at the proposed mine expansion would be almost identical to those of the existing Ruby Hill Mine during the active mining phase. As a result, potential cumulative impacts would be similar to those previously experienced during mining of the West Archimedes Pit. Following the completion of mining, processing, and reclamation, the contribution of mine expansion-related impacts to the cumulative noise and vibration environment would cease.

3.14.4 Mitigation and Monitoring

No monitoring or mitigation beyond the applicant-committed protection measures have been identified for noise or blasting vibrations.

3.14.5 Residual Adverse Impacts

Upon completion of construction, operation, and closure and reclamation activities, all potential mine expansion-related noise and blasting vibration impacts would cease. As a result, there would be no residual noise or blasting vibration impacts from the proposed mine expansion.



Ruby Hill Mine Expansion

Figure 3.14-1

Cumulative Impact Area for Noise

10/29/04

3.15 Cultural Resources

Cultural resources on all federal land are protected by a series of federal laws enacted to protect these resources from damage or loss due to federally funded or permitted activities. The public's recognition that these non-renewable resources are important and should be protected began very early in this century and continues to the present. New directions and emphases that have come to the forefront over the past 10 years include the Native American Graves Protection and Repatriation Act (NAGPRA), EO 13007, the consideration of historic and traditional landscapes, and the increased awareness of and consultation for traditional cultural properties. Three of the most important laws are the National Historic Preservation Act (NHPA) of 1966, as amended; the American Indian Religious Freedom Act (AIRFA) of 1978; and the Archaeological Resources Protection Act of 1979. EO 11593 also provides necessary guidance on protection and enhancement of cultural resources.

Under authority of the mandated policies described above, the project area was examined to locate any cultural resources within the potential area of effect of the proposed undertaking. Section 106 of the NHPA requires federal agencies to assess the effects of federal undertakings on historical and archaeological sites. This is accomplished by inventorying the area of effect, evaluating site importance and eligibility to the NRHP, assessing the effect of the undertaking on important sites, and consulting with appropriate historic preservation agencies.

The cultural resources study area for direct and indirect impacts is the original Ruby Hill Mine baseline cultural resources study area, which includes the proposed mine expansion areas. The cumulative effects area generally ranges from U.S. Highway 50 on the north and east to Hoosac Mountain on the south and the Mountain Boy Range on the west.

3.15.1 Affected Environment

3.15.1.1 Cultural Resource Surveys Conducted for the Existing Ruby Hill Mine

Several previous cultural resources surveys have been conducted within and adjacent to the proposed expansion area over the last 20 years. Since some of the survey boundaries overlap, many of the same sites were recorded multiple times (see **Figure 3.15-1**). Additionally, when first documented, the NRHP-eligibility of several sites was not assessed, and they remained unevaluated until subsequent surveys or analysis was conducted. This also resulted in multiple recordings of the same site. Short summaries of each survey are listed below in chronological order.

- Two surveys were conducted in the 1980s in the Hogpen Canyon area located to the east of the mine. A Class II (sample) survey in 1981 of 480 acres as part of a land sale recorded a large prehistoric basalt quarry and lithic scatter (CrNV-63-107) extending into Hogpen Canyon. A survey conducted by M. R. Polk in 1989 as part of the Eureka Waterline project identified additional historic and prehistoric loci of site CrNV-63-107 that extend into the mine area (Archaeological Research Services 1994a; Kautz et al. 1995).

Ruby Hill Mine Expansion

Figure 3.15-1

Cultural Survey Boundaries

02/02/05

- In April 1993, an inventory of approximately 470 acres was conducted in the Mineral Point prospect area by Frank W. Johnson Archaeological Consulting for Homestake as part of an exploration drilling program. The inventory identified 17 previously unrecorded sites (CrNV-63-7222 to -7238); 12 of the sites were historic and 5 consisted of small prehistoric lithic scatters. Additional components of two previously recorded historic sites also were recorded (sites CrNV-63-1075 and CrNV-63-4952). Of the survey total of 19 sites, all but 2 sites, CrNV-63-1075, the Holly Shaft and associated features and artifacts, and site CrNV-63-7233, a trash dump associated with site CrNV-63-1075, were ineligible to the NRHP with SHPO concurrence (Baldrica 1993; Foulkes 1993; Johnson 1993). Site CrNV-63-1075 was unevaluated, as was site CrNV-63-7233, due to the lack of a historic context at that time. Site CrNV-63-1075 was later evaluated by Kautz et al. (1995) and found to be eligible to the NRHP. Site CrNV-63-7233 remained unevaluated. Both sites were avoided during the exploration activities.

- In August and September 1993, Frank W. Johnson Archaeological Consulting also conducted a cultural resource inventory of approximately 325 acres at the Mineral Point prospect area as part of additional mineral exploration. This inventory identified three previously unrecorded archaeological sites (CrNV-63-6547 to -6549) and locii A to YY of site CrNV-63-6546 (Swift and Harper 1994). Locii A, D, J, L, M, R, W, KK, and RR of CrNV-63-6546 and site CrNV-63-6549 are eligible to the NRHP with SHPO concurrence. Locii N and P of site CrNV-63-6546 remained unevaluated. The remaining two sites are not eligible with SHPO concurrence. Site CrNV-63-6549 and the loci of site CrNV-63-6546 were avoided during the exploration activities.

- In 1994, the BLM consulted with Homestake and determined that a historic context for the entire Eureka Mining District was needed to assist BLM in considering the effects of future proposed mining activity in the area and to further evaluate the sites recorded during previous surveys. In March 1994, Kautz Environmental Consultants, Inc. contracted with Homestake to prepare a historic context to support the identification and evaluation of significant historic resources located in the historic mining district, with an emphasis on the Eureka Historic District. The Eureka Mining District, created in 1864, formed the study area for the historic context. One of the main functions of the historic context report was to aid in determining the significance of sites that may be identified in the future given the specific history of the Eureka Mining District. Kautz completed the historic context in December 1994.

- Archaeological Research Services, Inc. completed a Class III inventory of 1,045 acres in the Mineral Point area for Homestake in April 1994. Two previously recorded sites (CrNV-63-107 and CrNV-63-6546) and 53 previously unrecorded sites (CrNV-63-7559 to CrNV-63-7599, CrNV-63-7900 to CrNV-63-7911) were identified during this survey. Of the 53 new sites, 32 were prehistoric, 10 were historic, and 11 had both historic and prehistoric components (Archaeological Research Services, Inc. 1994a). Two sites, CrNV-63-7585 and loci 1 and 8 of site CrNV-63-63-6546 were recommended eligible to the NRHP by the BLM; the determination of eligibility for site CrNV-63-7585 was concurred with by the SHPO in January 1995 (Baldrica 1995). Locii A, D, J, L, M, R, W, RR, and KK of site CrNV-63-6546 also were listed as eligible to the NRHP with SHPO concurrence. Locii N and P were unevaluated. The BLM deferred a determination of NRHP eligibility for site CrNV-63-7567, pending further study. This decision was concurred with by the SHPO in January 1995. NRHP-eligible sites were avoided during the exploration work that led to the necessity for this survey, and monitors were present to ensure that no inadvertent impacts occurred to sites CrNV-63-7585, -7567, and -6546.

- An additional unevaluated site (CrNV-63-7962) was located during a monitoring program conducted by Archaeological Research Services, Inc., in July 1994. The site, the Holly Ditch, runs through the pit and waste rock dump areas (Archaeological Research Services, Inc. 1994b).

- Kautz Environmental Consultants, Inc. conducted a Class II sample survey in September 1994 within a 4,000-acre buffer zone surrounding the Mineral Point exploration areas north and west of Eureka. The survey area consisted of a 20 percent sample (approximately 840 acres) of the 4,000 acres divided into randomly selected transect corridors. The corridors were 100 percent surveyed. The survey was undertaken to aid in predicting the presence or absence of cultural resources in clearly distinguishable zones or locations, to determine the level of management involvement in anticipation of future exploration or expansion activities within the mine area, and to assist in determining areas that can be exempt from further Class III inventory requirements (Christensen and Kautz 1994).

- The sample survey confirmed that important prehistoric and historic resources generally are restricted to the intermediate slopes and steeper upland zones west of Eureka near Ruby Hill. It was recommended that areas south of U.S. Highway 50 and below 6,200 feet in elevation be exempt from further Class III inventory requirements, and that areas south of the highway and above 6,200 feet would require Class III surveys prior to future proposed disturbance if the area previously had not been surveyed. The survey identified 17 sites (CrNV-63-7980 to -7994, and loci E1, E2, and E3 of CrNV-63-107), including 2 prehistoric sites, 8 historic sites, and 7 sites with both historic and prehistoric components. Portions of site CrNV-63-107 had been previously identified. Of the 17 sites, only sites CrNV-63-7981, -7993, and the historic portion of site CrNV-63-7986 were identified as potentially eligible to the NRHP pending SHPO concurrence. The prehistoric portion of site CrNV-63-7983 was unevaluated (Christensen and Kautz 1994). Sites CrNV-63-7981, -7983, and -7986 have been determined eligible to the NRHP with SHPO concurrence. Site CrNV-63-7993 remains unevaluated.

- In March and April 1995, Kautz Environmental Consultants, Inc. conducted a Class III inventory of 632 acres in the Holly Shaft and Mineral Point areas in accordance with a PA between the BLM, the Nevada SHPO, and the Advisory Council on Historic Preservation (ACHP), with Homestake as a concurring party. The PA defines general and specific measures undertaken by the BLM, SHPO, ACHP, and Homestake to ensure that the mutual objectives and individual requirements of the NHPA are fulfilled. Included in the PA is a list of stipulations concerning the identification, evaluation, and treatment of those cultural resources located in proposed disturbance areas and determined eligible for listing on the NRHP. The PA is on file at the BLM Battle Mountain Field Office. The inventory was conducted for the original Ruby Hill Mine Final EIS (BLM 1997a). A total of 26 sites were identified during this survey (CrNV-63-8430 to 8438, CrNV-63-8441 to 88451, CrNV-63-1075, -1072, -4965, -4947, -4962, and -8454); including 4 prehistoric sites (CrNV-63-8432, -8433, -8438, and -4962), 15 historic sites, and 7 sites with both prehistoric and historic components (CrNV-63-1075, -8435, -8436, -8437, -4965, -8442, and -8445). Of these 26 sites, 3 (the historic portions of sites CrNV-63-1075 [the Holly Shaft] -4965 [the Bullwhacker Mine complex], and -8442 [the Williamsburg Mine complex]) are eligible to the NRHP with SHPO concurrence and 1 site (CrNV-63-1072) remains unevaluated until further archival and oral history work can place the site (Kautz et al. 1995). A suspected portion of the historic Lincoln Highway (site CrNV-63-8776) crossed through the leach pad and pit area (Kautz et al. 1996). Further evaluation of the highway determined that it was not associated with the Lincoln Highway and is ineligible to the NRHP.

- In Fall 1995, Kautz Environmental Consultants, Inc. also conducted Class III surveys in the vicinity of Windfall Canyon, Purple Mountain, Adams Hill, and scattered localities north and west of the proposed expansion area. These surveys identified 80 sites; 18 of these sites were identified as prehistoric, 44 were identified as historic, and 18 sites contained both prehistoric and historic components. Of these 80 sites, 12 were recommended eligible to the NRHP pending concurrence from the SHPO (CrNV-63-1073, -7983, -7993, -8713, -8720, -8733, -8735, -8739, -8750, -8751, -8753, and -8757) and 67 were judged ineligible to the NRHP pending SHPO concurrence. One site, CrNV-63-8777, remains unevaluated (Christensen et al. 1995).

- In May 1996, Kautz Environmental Consultants, Inc. prepared a historic preservation treatment plan for 14 sites located within the Ruby Hill Mine area designated as the "Historic Preservation Treatment Plan Boundary" (see **Figure 3.15-1**). Of the 14 sites, 10 contained both historic and prehistoric components (CrNV-63-1075 [Holly Shaft], -4965 [Bullwhacker Mine], -6546a, -6546d, -6546m, -6546n, -6546p, -6546r, -7585, and -8442 [Williamsburg Mine]), 3 sites contained only historic components (CrNV-63-1072, -6546j, and -6549), and 1 site contained only prehistoric components (CrNV-63-7567) (**Table 3.15-1**).

- Three of the 14 sites contained historic components recommended as eligible to the NRHP under Criteria A and D (CrNV-63-1075 [Holly Shaft], -4965 [Bullwhacker Mine], and -8442 [Williamsburg Mine]). Five of the sites contained historic components recommended as eligible under Criteria D (CrNV-63-6546a, -6546d, -6546j, -6546m, and -6549) and 2 sites contained prehistoric components also recommended as eligible to the NRHP under Criteria D (CrNV-63-6546r and -7585). NRHP Criterion A describes a property's eligibility in terms of its association with events that have made a significant contribution to the broad patterns of our history. Mitigation of adverse effects to properties regarded eligible under this criterion can include museum displays, popular brochures, historical markers, oral history, public lectures, and outdoor exhibits. Criterion D describes a property's eligibility in terms of its potential to yield information important in prehistory or history. Mitigation of adverse effects to properties considered eligible under Criterion D can include archival research, remapping of the sites, total feature inventory, photodocumentation, surface collection, systematic excavation, or some combination thereof.

- Four of the 14 sites were unevaluated (CrNV-63-1072 [T.L. Shaft], -6546n, -6546p, and -7567). Proposed treatment for the four unevaluated sites consisted of both testing and mitigation protocols. However, mitigation procedures would not be conducted if any of the 4 sites were determined ineligible for the NRHP as a result of testing (Kautz et al. 1996).

- Testing and data recovery of the 14 sites were conducted in June and July 1996. In August 1996, Kautz Environmental Consultants, Inc. summarized the results of the historic preservation treatment efforts in a report titled "Management Summary Historic Preservation Treatment Efforts (Data Recovery), Homestake Mining Company's Ruby Hill Project" (Mires 1996). The report focused on the field efforts largely pertaining to NRHP Criterion D testing and data recovery procedures. At the time of the report, the Criterion A treatment was either ongoing or had not been implemented. However, six separate

Table 3.15-1
Cultural Resource Sites Within the Historic Preservation Treatment Plan Boundary

Site Number	Site Description	Project Association[1]	NRHP Status[2]	Project Disturbance	Mitigation
CrNV-63-1072	T.L. Shaft	South of West Waste Rock Dump	E – Historic component	N/A	Data recovery
CrNV-63-1075	Holly Shaft	Southwest of West Archimedes Mine Pit	E – Historic component, NE – Prehistoric component	N/A	Data recovery
CrNV-63-4965	Bullwhacker Mine	South of West Waste Rock Dump	E – Historic component, NE – Prehistoric component	N/A	Data recovery
CrNV-63-6546a	Lithic and historic artifact scatter	East of West Archimedes Mine Pit	E – Historic component, NE – Prehistoric component	N/A	Data recovery
CrNV-63-6546d	Lithic and historic artifact scatter	East of West Archimedes Mine Pit	E – Historic component, NE – Prehistoric component	N/A	Data recovery
CrNV-63-6546j	Historic artifact scatter	East of West Archimedes Mine Pit	E – Historic component	N/A	Data recovery
CrNV-63-6546m	Lithic and historic artifact scatter	Southeast of West Archimedes Mine Pit	E – Historic component, NE – Prehistoric component	N/A	Data recovery
CrNV-63-6546n	Lithic and historic artifact scatter	Southeast of West Archimedes Mine Pit	NE – Historic component, NE – Prehistoric component	N/A	Tested
CrNV-63-6546p	Lithic and historic artifact scatter	Southeast of West Archimedes Mine Pit	NE – Historic component, NE – Prehistoric component	N/A	Tested
CrNV-63-6546r	Lithic and historic artifact scatter with pine nut roasting feature	Southeast of West Archimedes Mine Pit	NE – Historic component, E – Prehistoric component	N/A	Avoid
CrNV-63-6549	Historic artifact scatter	South of West Archimedes Mine Pit	E – Historic component	N/A	Data recovery
CrNV-63-7567	Prehistoric lithic scatter	Northwest of Heap Leach Pad	NE – Prehistoric component	N/A	Tested
CrNV-63-7585	Lithic and historic artifact scatter	East of East Waste Rock Dump	NE – Historic component, E – Prehistoric component	N/A	Data recovery
CrNV-63-8442	Williamsburg Mine	South of West Waste Rock Dump	E – Historic component NE – Prehistoric component	N/A	Data recovery

[1] Spatial relationship to original Ruby Hill Mine facilities.
[2] E – Eligible to the NRHP
NE – Not eligible to the NRHP

Source: Kautz et al. 1996.

actions were proposed to collectively mitigate the specific Criterion A concerns. These included: 1) a brochure regarding Eureka's mining history; 2) the donation of selected artifacts to the Eureka County Museum; 3) oral history interviews; 4) the donation of selected technical documents to Special Collections, University of Nevada, Reno; 5) the implementation of security measures designed to protect existing historic resources; and, 6) the placement of a historical marker on U.S. Highway 50. Previously unevaluated sites CrNV-63-1072 (T.L. Shaft), -6546n, -6546p, and -7567 required specific analytical efforts in order to establish NRHP importance for each one. As a result of testing and analysis, site CrNV-63-1072 (T.L. Shaft) was recommended as eligible for inclusion in the NRHP under Criteria A and D; the remaining sites were recommended as ineligible. Data recovery was completed on sites CrNV-63-1075 (Holly Shaft), -4965 (Bullwhacker Mine), -6546a, -6546d, -6546j, -6546m, -6549, -7585, and -8442 (Williamsburg Mine). Treatment of these sites included surface collection of selected artifacts, remapping of the site, photodocumentation, and excavation. As directed by the BLM, no data recovery was performed on the prehistoric component of site CrNV-63-6546r, a possible pine nut roasting feature.

- In Fall of 1996, Kautz Environmental Consultants, Inc. completed Criterion A treatment on sites CrNV-63-1075 (Holly Shaft), CrNV-63-4965 (Bullwhacker Mine), and CrNV-63-8442 (Williamsburg Mine) (Mires 1997). Criterion A treatment included a trifold brochure addressing Eureka's mining history, a donation of artifacts to the Eureka County Museum, a donation of documents to Special Collections at the University of Nevada in Reno, oral histories, an outline of suggested security measures to protect existing resources, and the placement of a State of Nevada marker on U.S. Highway 50.

- As a result of previous surveys conducted by Kautz Environmental Consultants, Inc. in 1994 (see above), it was recommended that areas south of U.S. Highway 50 and above 6,200 feet in elevation would require Class III surveys prior to future proposed disturbance if the area had not been previously surveyed. However, subsequent to the historic preservation treatment plan, the recommendation was revised to state that areas south of U.S. Highway 50 and above 6,200 feet in elevation would require Class III surveys prior to proposed new disturbance in areas within the historic treatment plan boundary that had not been previously surveyed, as well as areas outside of the treatment plan boundary (McGonagle 2004).

3.15.1.2 Cultural Resources Investigation Conducted for the Proposed Expansion Project

Two previously conducted Class III surveys (Kautz et al. 1995 and Christensen et al. 1996) cover all areas above 6,200 feet amsl that may be affected by the proposed expansion project; therefore, additional Class III surveys would not be required for proposed new disturbance in areas within the historic treatment plan boundary, as well as areas outside of the treatment plan boundary. However, two sites, CrNV-63-1072 (T.L. Shaft) and CrNV-63-6546r (an ethnographic site with a pine nut roasting feature), previously recorded within the proposed expansion area required additional archaeological work. The T.L. Shaft required mitigation in the form of a field visit to fully document standing structures (a head frame and two hoist houses) and archival and oral history work to complete the site's historic record. Site CrNV-63-6546r required a field reconnaissance to obtain accurate locational data on the site and define the site's boundary. In August 2004, mitigation was completed at the T.L. Shaft and the ethnographic site was relocated and accurately mapped using Global Positioning System (GPS) technology. Upon review of proposed expansion areas compared to the GPS location of the ethnographic site, it appears that site CrNV-63-6546r is located outside of the proposed expansion area (Kautz 2004). Therefore, CrNV-63-6546r would be avoided by the proposed project. No further work is recommended at this site.

3.15.2 Environmental Consequences

The significance of a cultural heritage resource is an assessment of its importance to the citizens of the United States and indicates whether a site has attributes that qualify it for inclusion on the NRHP. In order to be considered eligible for the NRHP, a cultural resource must be a district, site, building, structure, or object that retains its integrity of location, design, setting, materials, workmanship, feeling, and association, and satisfies at least one of the four significance criteria defined in 36 CFR Part 60.4. These criteria include:

- Part 60.4a – sites that are associated with events that have made a significant contribution to the broad patterns of history;
- Part 60.4b – sites that are associated with the lives of persons significant in our past;
- Part 60.4c – sites that embody the distinctive characteristics of a type, period, or method of construction, or that represent the work of a master, or that possess high artistic values, or that represent a significant and distinguishable entity whose components may lack individual distinction; and
- Part 60.4d – sites that have yielded, or may be likely to yield, important information on prehistory or history (National Park Service 1995).

Cultural heritage sites also are considered significant if they are protected under other state or federal statutes, such as the NAGPRA or the Nevada Indian Burial Protection Act (Nevada Regulations Statutes 383.150), which outlines procedures regarding treatment of human burials on state or privately-owned land in Nevada.

An undertaking has an effect on a cultural property if it alters any of the characteristics or criteria that may qualify the property for inclusion on the NRHP or otherwise affects a property’s legally protected status. Impacts to cultural heritage resources are considered adverse if the effect diminishes the integrity of the property’s location, design, setting, materials, workmanship, feeling, or association. Adverse effects can include, but are not limited to:

- Direct physical disturbance, damage, or alteration of all or part of a site or property that is listed on or is eligible for the NRHP, or is protected under state and/or other federal statutes;
- Isolation of the property from or alteration of the character of the property’s setting;
- Introduction of visual, audible, or atmospheric elements that are out of character with the property or alter its setting;

- Neglect of a property resulting in its deterioration or destruction; and

- Transfer, lease, or sale of the property (36 CFR 800.9, revised as of July 1, 1994).

Discussion of project-related impacts are limited to sites within the proposed expansion area deemed eligible for inclusion on the NRHP or sites that have federal and/or state protection under other statutes.

Effects of an undertaking that have been found to be adverse as described above may be considered not adverse when:

- The property is of value only for the potential contribution to archaeological, historical, or architectural research, and when that value can be preserved through appropriate research conducted in accordance with applicable professional standards and guidelines. This applies only to those sites identified as eligible to the NRHP under Criterion D and mitigated under treatment plans approved by the applicable agencies.

- The undertaking is limited to rehabilitation of structures that preserves the historical and architectural value of the property, and when transfer, sale, or lease include restrictions or conditions that ensure the preservation of the property's significant features (36 CFR 800.9[c][1-3]).

Sites eligible to the NRHP under Criteria A, B, and C that may experience adverse effects from the undertaking sometimes can be mitigated through such methods as development of educational centers or kiosks that provide information on the affected properties. Mitigation for sites nominated under Criteria A, B, and/or C that would experience adverse effects must be developed and defined in a treatment plan approved by the appropriate agencies.

3.15.2.1 Proposed Action

Ground-disturbing activities associated with the proposed mine expansion potentially could result in direct impacts to prehistoric, ethnohistoric, and historic cultural resources in the form of vertical and horizontal displacement of soils containing cultural materials and in the loss of integrity of the cultural deposits, loss of information, and alteration of site setting. Additionally, construction could result in direct impacts to cultural resources by altering site settings and isolating the resource from access and further study.

Indirect impacts potentially could result from increased erosion and increased human activity in the mine area, which make sites more vulnerable to accidental or deliberate disturbance and illegal collecting.

No known NRHP-eligible sites recorded within the proposed expansion areas would be directly or indirectly affected by the proposed project. All areas that would be affected by the proposed expansion have been covered by Class III surveys previously conducted for the existing Ruby Hill Mine. As a result of the surveys, fourteen sites were identified within the Ruby Hill Mine area. With the exception of site CrNV-63-6546r, a pine nut roasting feature, all of the sites have been completely mitigated. Site CrNV-63-6546r is located outside of the proposed expansion area and would be avoided by mine expansion-related disturbance. No further work is recommended for any of the sites.

As discussed in Section 2.3.14, Applicant-committed Environmental Protection Measures, if previously undocumented sites or subsurface components of documented sites are discovered within the Proposed Action area, construction would be halted until the resources are examined by professional archaeologists. If the resources are eligible for the NRHP or protected under state and federal statues, impacts would be mitigated through an appropriate data recovery program agreed upon in the PA that was developed for the existing Ruby Hill Mine.

Potential effects on the structural integrity of historic structures in the Eureka Historic District from blasting that could occur under the Proposed Action were studied in 1995. Seventy-nine structures, both historic and modern, were evaluated and the potential for impacts from blasting was modeled. This risk analysis study found that all structures surveyed would have less than one chance in a thousand or 0.1 percent of being cosmetically affected by blast vibrations if blasting charge weights were 200 pounds or less per delay. If blasting charges were 500 pounds per delay, two of the structures would have a greater than 0.1 percent chance of being affected. Typical charge weights proposed by Homestake would be approximately 200 pounds per delay, indicating that the structural integrity of historic buildings in the area would not be compromised (Golder 1996a). An additional study to test potential impacts from actual test blasts also was conducted. Results from this study indicated that the likelihood that any one structure in Eureka would be affected by any one blast was less than one in a trillion. The potential for damage to any structure over the life of the mine was determined to be less than one in 100 million (Golder 1996b). Golder (2004) conducted a recent review of potential blasting-related impacts as a result of the proposed mine expansion. Adjusting the blast locations for the proposed pit expansion area, and even raising the explosive weight to 400 pounds, the potential for damage to any structure would be less than one in 50 million. See Section 3.14, Noise and Blasting Vibrations, for a detailed discussion of the blasting studies.

Visual elements created by the proposed expansion should not be visible from the Eureka historic business district and, therefore, should not have an effect on the setting, character, or integrity of the Historic District.

3.15.2.2 No Action Alternative

Under the No Action Alternative, the proposed mine expansion facilities would not be constructed, and Homestake would continue to produce gold and silver from the existing facilities. No additional ground-disturbing activities would occur at the mine site. Prior to construction of the existing facilities, direct and indirect impacts to NRHP-eligible sites located in the area of the facilities were fully mitigated as discussed in the Ruby Hill Project Final EIS (BLM 1997***a***). Therefore, no impacts to cultural resources would occur under the No Action Alternative.

3.15.3 Cumulative Impacts

The cumulative impact area for cultural resources is shown in **Figure 3.3-1**. Interrelated projected are identified in **Table 2-9**. Any mining or other ground-disturbing activities within the cumulative impact area could affect NRHP-eligible sites or state and federally protected sites. As directed by law, cultural resources inventories and consultations would be conducted for any projects involving public lands, and impacts would be avoided or mitigated as appropriate. All actions associated with Homestake activities would be in accordance with guidelines established in the PA that was developed for the existing Ruby Hill Mine between Homestake, the BLM, SHPO, and ACHP. No known NRHP-eligible sites would be impacted by the proposed expansion; therefore, no cumulative impacts to important cultural resources are expected to occur.

3.15.4 Mitigation and Monitoring

All known NRHP-eligible sites identified within the proposed mine expansion areas have been mitigated; therefore, no mitigation or monitoring is recommended.

3.15.5 Residual Adverse Impacts

No residual adverse impacts are anticipated, because all known NRHP-eligible sites identified within the proposed mine expansion areas have been mitigated.

3.16 Native American Traditional Values

The Native American traditional values study area for direct and indirect impacts is the original Ruby Hill Mine study area, which includes the proposed mine expansion areas. The cumulative impact area generally ranges from U.S. Highway 50 on the north and east to Hoosac Mountain on the south and the Mountain Boy Range on the west.

As federal agents, the BLM is mandated to consult with Native American tribes concerning the identification of cultural values, religious beliefs, and traditional practices of Native American people that may be affected by actions on federal lands. This consultation includes the identification of places (i.e., physical locations) of traditional cultural importance to Native American tribes. Places that may be of traditional cultural importance to Native American people include, but are not limited to, locations associated with the traditional beliefs concerning tribal origins, cultural history, or the nature of the world; locations where religious practitioners go, either in the past or the present, to perform ceremonial activities based on traditional cultural rules or practices; ancestral habitation sites; trails; burial sites; and places from which plants, animals, minerals, and waters possessing healing powers or used for other subsistence purposes, may be taken. Additionally, some of these locations may be considered sacred to particular Native American individuals or tribes. Under the auspices of AIRFA, EO 13007 of 1996 (Indian Sacred Sites), NAGPRA, and NHPA, as amended, the BLM must take into account the effects of federally-permitted undertakings on these types of locations.

In compliance with the mandates described above, notification and requests for comment letters on the original Ruby Hill Mine were sent in May 1995 to Tribal Chairs of the Yomba Shoshone Tribal Council, Western Shoshone Defense Project, Duckwater Shoshone Tribe, Battle Mountain Band, Duck Valley Tribal Council, Elko Band, Ely Shoshone Tribe, South Fork Band, Te-Moak Tribe, Wells Band, Nevada Indian Environmental Coalition, Western Shoshone Historic Preservation Society, Western Shoshone National Council, and the Spiritual Leader of the Western Shoshone Nation as part of the Native American consultation conducted for the Ruby Hill Project (BLM 1997a). These groups were identified as having potential ties to the project area. In June and July 1995, follow-up telephone calls were made by Western Cultural Resource Management, Inc. (WCRM), and a site visit for representatives of tribal groups and organizations was conducted by WCRM on August 2, 1995, with approval from the BLM and Homestake.

One representative of the Yomba Shoshone Tribe, four representatives of the Western Shoshone Defense Project, and the Western Shoshone spiritual leader, attended the site visit, which focused on sites potentially eligible to the NRHP as a traditional cultural property. After the site visit, participants were asked to make recommendations. Additional telephone calls were made to individuals who either could not attend the site visit or were unable to stay for the recommendation meeting. Copies of the consultation report were sent to the tribal representatives that had requested it.

A second site visit by a tribal representative of the Yomba Shoshone Tribe, four representatives of the Western Shoshone Defense Project, and a tribal representative of the Western Shoshone was conducted in July 1996 to all prehistoric sites undergoing testing and/or data recovery (CrNV-63-6546n, -6546p, -7567, and -7585). A Native American monitor was present during data recovery operations at the sites.

On August 3, 2004, requests for tribal participation were sent out of the BLM Battle Mountain Field Office as part of the Native American consultation initiation on the currently proposed expansion project. The following tribal groups/members were sent letters: Tribal Chairs and Cultural/Environmental staff of the Yomba Shoshone, South Fork Band, Elko Band, Duckwater Shoshone, Western Shoshone Defense Project, Battle Mountain Band, Wells Band, Te-Moak Tribe, and Ely Shoshone. The letters informed the tribal groups/members of the proposed expansion and requested that any information other than that provided during consultation for the original Ruby Hill Mine be provided to the BLM within 30 days after receipt of the letter (Dixon 2004). To date, there have been no responses to the letters from any of the tribes. Since the proposed expansion is within the original Ruby Hill Mine permit area, it is not anticipated that much new information will be received from the contacted tribal groups/members. NRHP-eligible sites identified by tribal representatives during consultation on the original Ruby Hill Mine would be avoided or mitigated. The BLM has contacted each of the tribes by telephone as a follow-up to the letters; no new traditional/cultural/spiritual issues have been identified. Any specific information provided by tribal groups/members concerning traditional/cultural/spiritual sites in the proposed expansion area would remain confidential.

3.17 Social and Economic Values

The study area for the socioeconomic assessment is the town of Eureka and surrounding rural areas. The cumulative impact area generally includes the area from the Eureka/Lander county line eastward to the Diamond Mountains and extending from approximately 12 miles south of Eureka to approximately 34 miles north of Eureka.

3.17.1 Affected Environment

Eureka County is located in east-central Nevada. With an area of approximately 4,200 square miles and a population of approximately 1,500 residents (2003 estimate), Eureka County is the second least populous county in the State of Nevada (U.S. Census Bureau 2004). The county is long and narrow, approximately 128 miles from north to south, and between 22 and 42 miles wide. Eureka, the county seat and largest of the three unincorporated communities in the county, is located in the southern portion of the county. Beowawe and Crescent Valley are located in the northwestern portion of the county. Farm and ranch households live on agricultural operations throughout the county (U.S. Department of Agriculture 2004).

The proposed expansion is north of, and immediately adjacent to, the town of Eureka. The assessment considers the Eureka County government and ECSD. The former provides all administrative functions for the county and unincorporated towns, and the Eureka County Board of Commissioners serves as the Eureka Town Board. The school district is responsible for providing public education in the county.

The town light-heartedly boasts of being the "Friendliest Town on the Loneliest Road in America," referring to its location on U.S. Highway 50 across sparsely populated central Nevada, remoteness from other cities and also the warmth, openness, and hospitality of its residents. Elko, the regional trade and service center for northeastern Nevada, lies 115 miles to the north, while Ely is 77 miles to the east. Reno, 240 miles west of Eureka, is the nearest metropolitan area. Bypassed by major highways and having limited new development, many historic buildings survive in Eureka to offer tourists a look back in time to the town's mining heyday. Spurred by restoration of the Eureka Opera House in 1993, the county initiated economic development efforts to increase tourism, attract new industry, and encourage overall community development (Eureka County Chamber of Commerce 1995; Eureka Economic Development ***Program 2003***).

3.17.1.1 Economy and Employment

The economic fortunes of Eureka County and its residents have been tied to mining since the discovery of silver-lead mineralization near the present site of the town of Eureka in the 1860s. Improvements in smelting processes fostered increases in production and rapid population growth, such that by 1878, Eureka was the state's second largest city. As ore bodies played out, mine production and population declined nearly as rapidly as it had grown. Several more cycles of mine activity occurred in the Eureka area since then, but none approached the magnitude of the first boom (Eureka County Chamber of Commerce 1995).

The 1980s brought mining's latest resurgence in the region, this time driven by large-scale surface gold mines located along the Carlin Trend in northern Nevada. In 1980, approximately 275,000 ounces of gold were produced in Nevada. By 1986, annual production topped 2.0 million ounces, with the 5.0 million-troy ounce per year milestone reached in 1989. Annual gold production in Nevada peaked at nearly 8.9 million ounces in 1998, declining to 7.3 million ounces in 2003. Statewide gold production accounts for approximately 10 percent of worldwide production, trailing only South Africa and Australia in terms of annual production. Nevada also leads the nation in silver production, most of which is a byproduct of gold production, with 10.2 million ounces produced in 2003 (Nevada Division of Minerals, no date).

The two largest gold producers in Nevada, Barrick Goldstrike's Betze/Post Mine and Newmont Mining's Carlin Trend complex, are located in northern Eureka County. The two mines had a combined production in excess of 3.4 million ounces in 2002, approximately 45 percent of the statewide total (Nevada Bureau of Mines and Geology 2003). In addition to those two mines, several smaller mines, including the existing Ruby Hill Mine, initiated operations in the late 1980s and 1990s; all of the smaller mines except the Ruby Hill Mine have since ceased operations.

Most of the employees and mining service firms supporting the Barrick and Newmont operations are based outside of Eureka County, primarily in Elko. Elko County had 45,291 residents in 2000, of which 16,708 resided in the city of Elko (U.S. Census Bureau 2002).

Mining's resurgence is evident in local and regional employment trends. Mining employment in a 5-county region encompassing Elko, Eureka, Humboldt, Lander, and White Pine counties increased from 2,384 in 1980 to a peak of 10,596 in 1997 when the existing Ruby Hill Mine started operations. Since 1997, regional mining employment has decreased by nearly 4,000 jobs to an estimated 6,683 employees in 2003. The declines are due to productivity gains and cutbacks tied to falling gold prices.

With mining the region's primary industry, total employment in the 5-county region climbed to 49,995 in 1997, an increase of 67 percent and nearly 20,000 net new jobs in a 10-year time span. Since then, nearly 6,800 jobs have been lost across the region, including an estimated 3,913 jobs in the mining industry (U.S. Bureau of Economic Analysis 2004; Nevada Department of Employment, Training, and Rehabilitation 2004).

Employment in Eureka County has mirrored the regional trend, increasing from 935 in 1980 to a peak of 5,321 in 1997 coinciding with the startup operations at the existing Ruby Hill Mine (**Table 3.17-1**). Most of the change occurred in the mining industry, where the number of jobs jumped from 361 in 1980 to 4,374 in 1997. Mining and total employment have both declined since the peak in 1997; total employment falling to 4,080 jobs in 2002, most of which is accounted for by the loss of over 900 jobs in the mining industry. Additional losses followed the cessation of mining operations at the existing Ruby Hill Mine in 2002, though gold and silver recovery at the existing heap leach facilities continues to the present day.

In keeping with national trends, local farm employment in Eureka County has declined steadily over time. Other private sector and local government employment in Eureka County, the former primarily in construction, retail trade, and services, increased during the period when mining increased in the mid-1990s, but has since declined.

The local business sector in Eureka is limited in diversity and scale, focused primarily on essential consumer, building, and automotive goods and services. Retail shopping opportunities include groceries, hardware and lumber, auto parts/fuel/supplies, and novelties and gifts targeted at tourists. There also are

Table 3.17-1
Eureka County Employment Trends

Year	Farm	Mining	Other Private	Government	Total
1980	198	361	264	112	935
1985	175	690	249	127	1,241
1990	181	3,586	287	170	4,224
1995	129	3,965	562	228	4,884
1996	145	4,200	618	252	5,215
1997	162	4,374	511	274	5,321
1998	159	4,143	386	259	4,947
1999	160	3,805	404	238	4,606
2000	162	3,735	370	229	4,496
2001	163	3,607	323	227	4,320
2002	150	3,479[1]	243	208	4,080

[1] Mining employment in 2002 is estimated based on the BEA's reported 2001 employment and the 2001 to 2002 change in mining jobs reported by the state.

Source: U.S. Bureau of Economic Analysis 2004; Nevada Department of Employment, Training, and Rehabilitation 2004.

several restaurants, bars, and beauty/barber shops in Eureka. Consumer and business services include a bank, motels, and RV/trailer parks, equipment rental, trucking, and motor vehicle repair services. Consumers use the internet or travel to Elko, Reno, or elsewhere to access a wider selection or more specialized goods, financial services, and a broader range of medical and dental care. Local merchants benefited from the economic stimulus associated with the earlier operations of the Ruby Hill Mine and more recently the construction of the Falcon to Gonder high-voltage transmission line. However, businesses are experiencing declining sales as the level of activity with these projects diminished.

The resident labor force is limited, a reflection of the county's small population base. Prior to the initiation of operations at the existing Ruby Hill Mine, the county's labor force totaled just 785 persons. In 1995, 68 individuals were unemployed, an unemployment rate of 8.7 percent. Both the labor force and number of unemployed rose subsequently, largely in conjunction with the work force needs of the mining industry (see **Table 3.17-2**), both locally and in neighboring White Pine and Lander counties. The resident labor force peaked at 1,023 in 1998, but has since declined to 740 as workers and their households have migrated from the county in search of other employment. Unemployment and unemployment rates dropped below 5.0 percent between 1999 and 2002, while the Ruby Hill Mine was operating, but have since climbed.

The mining industry's expansion in Eureka County is reflected in local personal income trends (**Table 3.17-3**). Following the opening of the Barrick and Newmont mines, total earnings increased more than five-fold between 1985 and 1990, from $31.9 to $167.6 million. Further increases marked the expansion of those mines, with total annual earnings reaching $274.8 million in 1995. Since that time, total earnings in the county have climbed only modestly, as employment decreases have offset gains due to increases in average wages.

Table 3.17-2
Eureka County Labor Force and Unemployment from 1995 to 2003

	1995	1996	1997	1998	1999	2000	2001	2002	2003
Labor Force	785	851	976	1,023	922	813	773	750	740
Unemployed	68	64	55	56	41	54	31	30	40
Unemployment Rate (percent)	8.7	7.5	5.6	5.5	4.4	2.9	4.0	4.6	5.6

Source: Nevada Department of Employment, Training, and Rehabilitation 2004.

Table 3.17-3
Eureka County Personal Income and Place of Residence for Selected Years

	1990	1995	2000	2001	2002
Earnings – Place of Work (million)	$167.6	$274.8	$278.0	$282.8	$287.9
Residency Adjustment[1] (million)	($134.3)	($216.7)	($220.2)	($223.7)	($229.0)
Social Security Deductions (million)	($ 7.9)	($ 34.8)	($ 32.1)	($32.6)	($33.9)
Other Income to Residents (million)	$7.1	$12.5	$12.4	$13.1	$13.6
Total Personal Income – Residents (million)	$32.5	$34.8	$38.1	$39.7	$38.6
Per Capita Income	$23,052	$25,708	$23,242	$24,230	$23,927

[1] A negative residency adjustment reflects the net earnings of workers who are employed in Eureka County but reside elsewhere, primarily in Elko County, that are in excess of the earnings of Eureka County residents who are employed outside the county.

Source: U.S. Bureau of Economic Analysis 2004.

Most of the labor earnings paid by Eureka County employers flow out of the local economy due to the many workers commuting from elsewhere to work in the mines in northern Eureka County. In 2002, a net outflow of $229 million occurred, equivalent to 80 percent of the total wages and salaries paid in Eureka County. The personal income of residents, including adjustments for social security deductions and other income, such as interest and dividends, was $38.6 million. Although data are not yet available for 2003, further reductions likely followed the cessation of mining at the existing Ruby Hill Mine (U.S. Bureau of Economic Analysis 2004).

Despite the higher than average wages and salaries paid by the mining industry, Eureka County residents lag behind the state and national benchmarks in terms of per capita income. After rising to $27,837 in 1998, per capita income has declined (see **Table 3.17-4**). In 2002, the per capita income of Eureka County residents was 22 percent below the statewide average of $30,599. The nationwide average was $30,906 for the same period.

Table 3.17-4
Per Capita Personal Income for Selected Years

	1990	1995	2000	2001	2002
Eureka County	$23,052	$25,708	$23,242	$24,230	$23,927
Nevada	$20,346	$24,817	$30,438	$30,347	$30,599
U.S.	$19,477	$23,076	$29,847	$30,527	$30,906

Source: U.S. Bureau of Economic Analysis 2004.

3.17.1.2 Population and Demography

Eureka County's population peaked at over 7,000 in the late 1800s. The subsequent decline in mining and lack of economic diversification resulted in a long-term decline to just 948 residents in 1970. Population rebounded with mining's resurgence; climbing to 1,547 residents in 1990, and subsequently to 1,840 in 1988 during the construction and early operations at the Ruby Hill Mine (see **Table 3.17-5**). Population has declined steadily since, falling to 1,513 residents in 2003.

Table 3.17-5
Eureka County Population from 1990 to 2003

	1990	1996	1997	1998	1999	2000	2001	2002	2003
Population	1,547	1,454	1,731	1,840	1,697	1,651	1,639	1,613	1,513

Source: U.S. Census Bureau, Population Division 2004.

At the time of the 2000 decennial census, approximately two-thirds of the county's residents (1,103) lived in Eureka and nearby outlying areas in the southern portion of the county, with 548 residents in Beowawe, Crescent Valley, and elsewhere in the northern portion of the county. The median age of area residents was 38 years compared to 35 years across the state as a whole. Residents 35 to 44 years of age comprised the single largest age group reported by the Census Bureau, 209 residents or 18.9 percent of the area's population.

The average household size in southern Eureka County was 2.5 persons, slightly below the statewide average of 2.6 people. Children and young adults under 18 years of age represented 29.2 percent of the population, compared to 25.6 percent in Nevada as a whole. At the same time, seniors aged 65 and over comprised 12.1 percent of the local population, compared to 11.0 percent of Nevada's overall population (U.S. Census Bureau 2002).

The racial composition of the local population is more predominately white than that of the state as a whole. In 2000, 92.3 percent of area residents identified themselves as white, alone or in combination with one or more other races. That compares to 78.4 percent at the statewide level.

In 2001, the existing Ruby Hill Mine employed an average of 98 employees. Of those, 20 were single and 78 were married. Of the total, 69 employees reported having one or more dependents. The median age of the mine's work force was approximately 41 years of age in 2000, slightly older than the 38 years for all Eureka County residents.

3.17.1.3 Housing

Eureka County's housing inventory tallied 817 dwelling units in 1990 (**Table 3.17-6**). By 2000, following the opening of the existing Ruby Hill Mine and growth in the northern portion of the county, the housing stock had increased by nearly 25 percent to 1,025 units. The total included 30 dwelling units built by Homestake to help address housing needs arising in conjunction with the Ruby Hill Mine in the mid 1990s. Of the total, 666 (65 percent) were occupied and 359 were vacant. Owner-occupied housing numbered 491 units, and renter-occupied homes totaled 175. As in many rural western communities, mobile homes are the predominant form of housing in Eureka County (599 units or 58.4 percent). Of the 391 dwellings in permanent structures, most were single-family detached homes. Two-thirds of the 1990 housing stock (542 units) was located in Eureka or elsewhere in the southern portion of the county.

Table 3.17-6
Eureka County Housing Inventory for 1990 and 2000

Type	1990	2000	Change
Single and Multifamily	289	391	102
Mobile Homes and Other	528	634	106
Total Units	**817**	**1,025**	**208**

Source: U.S. Census Bureau 2002.

The Eureka County Assessor compiles records of year-round housing for the tax rolls. Records for 2003 suggest a net reduction of 80 to 100 dwelling units in Eureka County between 2000 and 2003 in response to the economic weakness in the mining industry (Rebaleati 2004). Such changes generally reflect a relocation of mobile homes, either by their owners or the finance/mortgage company's reclaiming units that are in default on the loans. While such movement represents a reduction in the current availability of housing, it also indicates a latent supply of trailer pads and lots to accommodate new growth. Detailed data regarding the availability of vacant units for sale or rent are not available. However, an informal reconnaissance survey and discussion with local officials identified a relatively large supply of available units. Local officials expressed little concern over housing for the proposed expansion. In part, that is because of the expansion of housing inventory that occurred in response to the mine and the units built by Homestake.

Temporary accommodations in the town of Eureka include four motels and inns offering a total of 88 rooms and four trailer and recreational vehicle parks providing nearly 100 spaces for recreational vehicles, travel trailers, and mobile homes. During the peak summer tourist travel and hunting seasons, the short-term accommodations frequently are at or near full occupancy. Temporary housing demands associated with the construction work force on the Falcon to Gonder transmission lines contributed to high occupancy rates through 2003 and early 2004, but the demand has since abated as that project was completed in the area.

No modular or mobile home dealers have outlets in Eureka. However, dealers from throughout the region sell, transport, and set up homes in Eureka for customers who have a lot or space in a mobile home park.

3.17.1.4 Community Facilities and Services

Public Safety

The Eureka County Sheriff provides law enforcement for the entire county and operates the county's detention facility. The Sheriff's Department handles dispatch for all public safety functions in the southern portion of the county, including the Nevada State Patrol, emergency medical, and fire suppression activities. The Sheriff's Department staff totals 18; the sheriff, 6 patrol officers, 6 dispatchers, 3 jailers, and 2 administrative personnel. Several job openings are being advertised, but the department faces challenges recruiting qualified personnel willing to relocate. Current staffing does not allow continuous 7-days per week, round-the-clock patrol in the town of Eureka. However, officers are on call during non-patrolled hours and to back up the on-duty staff, if needed (Black 2004; Sanders 2004).

The Eureka VFS provides fire suppression service in and around the town of Eureka. The VFS is one of six local volunteer fire departments funded by Eureka County. These departments, along with the Nevada Division of Forestry and BLM maintain mutual-aid agreements to augment the capacities of any given department should the need arise. Eureka County provides funds to the Nevada Division of Forestry to help fund its fire suppression activities.

The VFS is staffed by 20 volunteers, smaller then when the existing Ruby Hill Mine was at full operations, because 5 or 6 members of Homestake's staff were actively involved in the VFS. The Eureka VFS maintains five pieces of equipment, including two pumpers, a 2,500-gallon tanker, a tender, and a rapid response/brush fire truck. The equipment is housed in a 5-bay firehouse. Improvements to the existing firehouse or construction of a new facility have been discussed, but no plans for either are pending (Damele 2004; Rebaleati 2004).

Water pressure and the number and placement of hydrants in Eureka for fire protection purposes are excellent, as is storage, given the town's combined storage of 1.4 million gallons (Damele 2004).

The county funds a separate emergency management services coordinator to coordinate emergency planning, response, and management among the various local service providers and to serve as a liaison with various statewide entities. The emergency management services coordinator also directs the volunteer ambulance/emergency medical service in Eureka (Marshall 2004).

Public Education

The ECSD is headquartered in the town of Eureka. In addition to its administrative offices, the ECSD operates an elementary and a junior/senior high school in Eureka and an elementary school (K-6) in Crescent Valley. The Eureka elementary school opened for the 1995-1996 school year with a design capacity of approximately 300 students and an optimum capacity of approximately 225 students. The core facility at the junior/senior high school was built in 1968. Renovations to that facility have addressed technology and mechanical needs, but have not addressed all capacity and curriculum/instruction needs. There are three older, functionally and mechanically obsolete, modular classrooms at the high school that are well into their second decade of use. The ECSD will seek electorate approval of a $6.0 million bond issue in the upcoming general election, proceeds of which would be used to replace the modular units and fund new classrooms and labs to improve the functionality of the core facility (Zunino 2004).

During the preceding 10 school years, total fall enrollment in the district climbed from 274 to a peak of 378 students during the 1997-1998 school year, then declined to 220 students in the recently completed 2003-2004 year. Compared to the peak, the 1993 fall enrollments in the elementary grades represented a decline of 91 students (41 percent), and a decline of 67 junior and senior high school students (see **Figure 3.17-1**). Enrollments at the schools in Eureka are now at levels not experienced since the late 1980s.

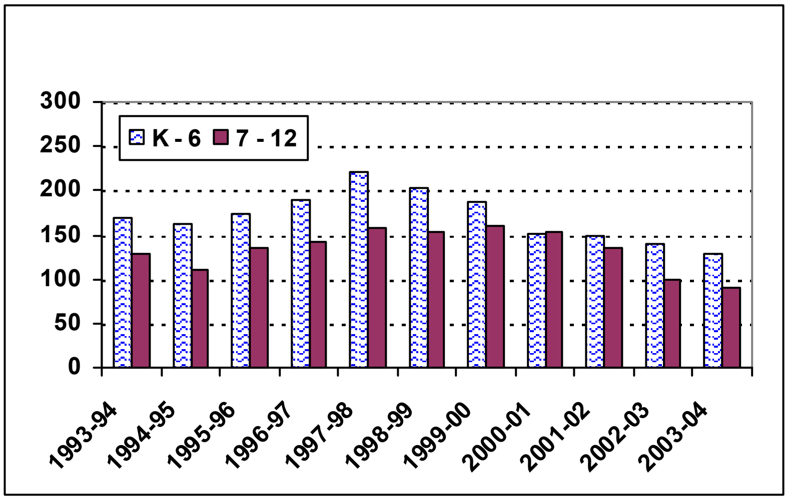


Figure 3.17-1. Eureka County School District Elementary and Secondary Enrollment

Declining student enrollments have had several implications for the ECSD. First, the declines have generated capacity to accept future enrollment increases within current facilities, without immediately requiring additional capital construction. Second, the declines have corresponded to reductions in the net proceeds from mining due to declining gold production and lower prices. The ECSD's finances, which benefit heavily from taxes on such proceeds, are consequently not as strong as in earlier years. Third, the combination of declining revenue and lower enrollment have resulted in cutbacks in staffing, from 49.5 full-time employees in the 1999 school year to 33.5 full-time employees in the 2003 school year.

Due to geographic distances between communities, school districts in Nevada often serve students who live in rural areas outside the ECSD's boundaries. During the recently completed 2003-2004 school year, approximately 20 students from the Duckwater Indian Reservation in Nye County attended schools in Eureka. At the same time, approximately 35 junior and senior high school students from the Crescent Valley and Beowawe area attended Battle Mountain High School in neighboring Lander County.

<u>**Health Care and Social Services**</u>

Health care in southern Eureka County is provided at the Eureka Medical Clinic, operated by the Nevada Health Centers, Inc. The clinic is staffed by a physician, physician's assistant, two medical assistants, and an administrative employee. Financial support for the clinic is provided from fees for service, county revenues, and federal grants and health care funding programs. The clinic's medical staff provides 7-days-a-week service and staffs a branch clinic in Austin 1 day per week. The nearest hospitals are in Elko (115 miles away) and Ely (77 miles away), though patients requiring specialized care often choose to access facilities in Reno. A public health nurse visits Eureka periodically offering immunizations and routine medical screening. Dental care is provided by a visiting dentist and a dental technician, using facilities at the Eureka clinic (Nanton 2004). The clinic and staff provide a higher level of medical/health care than is available in many smaller, rural Nevada communities.

Emergency medical care and transportation are provided by the Eureka County Emergency Medical Services, a volunteer ambulance service serving the entire county. The service is funded through user fees and Eureka County. A coordinator and sixteen other emergency medical technicians are on call, and two ambulances and a search and rescue vehicle are housed in a garage and training facility in Eureka completed in 1997. Additional staff and two more ambulances housed in another garage serve the Crescent Valley area. The ambulances have radio communication with Elko General Hospital, where most patients are transported. Fixed-wing and rotary wing emergency medical air transportation is available to hospitals in Elko, Reno, and Salt Lake City (Marshall 2004). The Eureka County sheriff's office handles dispatch for the ambulance service.

Utilities

Public water and wastewater utilities serve the town of Eureka. Most other areas of the county are on individual wells and septic systems. Eureka's water supply is from two high-volume wells north of town and spring-fed sources south of town. Total production capacity is over 1,000 gallons per minute. The town has a total water storage capacity of over 1.4 million gallons, adequate for both consumptive use demand and fire protection requirements. New water lines were installed throughout most of the town in the early 1990s (Damele 2004).

A multiple-cell aerated, evaporative lagoon facility handles wastewater treatment needs for the town. The existing facility is adequate for the current effluent volumes given the area's arid climate. The system could accommodate at least a 25 percent increase in volume without the need to expand capacity. Capacity expansion could be achieved by adding additional cells to the current system or building a primary treatment system (Damele 2004).

Mt. Wheeler Power, Inc., a rural electric cooperative, serves the electrical energy needs of the town of Eureka and surrounding area. There is no natural gas service in the area; however, propane and bottled gas are available from local suppliers.

Library

Local libraries operate in Eureka, Crescent Valley, and Beowawe. Eureka County provides operating funding, buildings, and other equipment for the library and contracts with the Elko-Lander-Eureka Library System for personnel and administrative support.

Recreation Facilities

The county funds a county-wide recreation program. An indoor swimming pool, several ball fields, and playgrounds and some activities are funded in the town of Eureka through this program. The ECSD maintains indoor gymnasiums and a running track/football field complex in Eureka. Although school-sponsored events and activities have preference at these facilities, they also support community recreation.

County Government Administrative Facilities

Eureka County offices are housed in the historic courthouse and in several nearby buildings. A new auxiliary administrative office building was completed in 1996, and renovations to the courthouse were completed in

1998. The primary administrative functions, including the commissioners' offices, clerk/recorder, assessor and treasurer are housed in the courthouse, with the public works department, county attorney, economic development and Yucca Mountain Information Office located in the new office building (Damele 2004).

3.17.1.5 Public Finance

The primary governing bodies in Eureka County are the Board of County Commissioners and the ECSD. The County Commissioners oversee county operations, including administration, law enforcement, judicial, public works, and economic development. The County also administers the budgets of the town of Eureka and various special districts. The ECSD serves the entire county and is governed by an elected board, with the superintendent and administration responsible for day-to-day operations.

Local government and school finances in Nevada are complex, involving locally derived and state-shared revenues. The former consist primarily of ad valorem property taxes on real and personal property and the net proceeds of mines located within the county. The latter include sales, motor vehicle, fuel, and gaming tax revenues. Intergovernmental transfers from the state are particularly important in Nevada and have evolved in response to the state's unique tax, economic, and geopolitical structure, particularly several that arise because of economic disparities between the Las Vegas and Reno metropolitan areas and rural agricultural and mining communities. Current fiscal conditions of the two primary entities are summarized below.

Eureka County

The County's fiscal structure reflects a heavy dependence on ad valorem tax base and necessary responses to the combined influences of a small population base, large physical service territory, and substantial year-to-year variances in mining-related tax base and tax revenues. For example, Eureka County's assessed valuation, which also applies to the school district, declined by $110 million (18 percent) between fiscal years 1998 and 1999, then increased by $28.6 million the following year (see **Table 3.17-7**). Another sharp decline occurred between fiscal years 2001/2002 and 2002/2003, when reappraisal of the mines to reflect lower gold prices resulted in a $ 174.6 million (35 percent) decline in total taxable assessed value. That decline was followed by an $81.7 million increase the next year and another $88.8 million jump for the current fiscal year.

The volatility in taxable value carries over to ad valorem tax revenues, influencing local government and school district fiscal budgeting and policies. Ad valorem taxes levied on that tax base by Eureka County in recent years declined from $3.95 million in fiscal year 2001/2002 to $2.95 million in fiscal 2002/2003, then increased to $3.43 million for fiscal year 2003/2004 (**Table 3.17-8**). These taxes are paid largely by the mining industry. Combining the real and personal property valuations associated with mining and the net proceeds from mining shows the current reliance of local government finances on the mining industry at approximately 90 percent of the total ad valorem tax base of the County and ECSD. Recognizing that volatility in such revenues and inherent timing lags between changes in mining activity, assessment of taxes, and receipt of revenues, the Eureka Board of County Commissioners has adopted a policy of maintaining relatively steady property taxes, funding reserve accounts during periods of prosperity, but drawing down reserves to cushion the impacts of a mine closure or declining assessments.

Table 3.17-7
Trends in Net Proceeds and Property Assessments
(Millions)

Fiscal Year	Net Proceeds from Mining	Real and Personal Property Assessments	Total Taxable Value
1997/1998	$263.2	$442.4	$705.6
1998/1999	$185.6	$441.3	$626.9
1999/2000	$117.8	$399.0	$516.8
2000/2001	$120.0	$425.4	$545.4
2001/2002	$90.0	$422.8	$512.8
2002/2003	$70.0	$253.4	$323.4
2003/2004	$85.0	$330.1	$415.1
2004/2005	$150.0	$353.9	$503.9

Source: Eureka County, County Recorder/Auditor's Office 2003; Nevada Department of Taxation 2001, 2002a, b, and 2004.

Table 3.17-8
Eureka County Revenues for Fiscal Years 2002 to 2004

Types of Revenue	Fiscal Years		
	2001/2002	**2002/2003**	**2003/2004**
Ad Valorem Taxes			
General Property	$3,255,737	$2,316,519	$2,867,136
Net Proceeds of Mining	$693,038	$632,017	$566,110
Other Taxes	$126,913	$106,915	$91,228
Licenses and Permits	$13,909	$13,979	$7,920
Intergovernmental	$4,536,665	$5,216,445	$4,079,352
Charges for Services	$441,920	$488,631	$224,000
Fines and Forfeits	$63,264	$106,032	$88,700
Miscellaneous	$1,272,891	$1,070,307	$819,270
Total Revenue	**$10,404,337**	**$9,950,845**	**$8,746,766**

Source: Eureka County, County Recorder/Auditor's Office 2003 and 2004.

Other locally derived revenues have declined by 35 percent for the past 3 years, from $1.89 million to $1.23 million; accounting for 14 percent of the County's total annual revenues in fiscal year 2003/2004 (see **Table 3.17-8**). Such revenues include other taxes, fees, fines and charges generated by County departments and interest earnings on reserves and funds that the County accrues to meet capital outlay requirements and temper the year-to-year fluctuations in ad valorem taxes. Lower returns on these reserves, tied to the weak national economy and historically low interest rates, are the primary cause of the reduction in other local revenues.

Intergovernmental revenues account for most of the County's remaining revenues. Such revenues totaled $4.5 million in fiscal year 2001/2002, climbed to $5.2 million the following year, but decreased to just under $4.1 million in the 2003/2004 budget year. Intergovernmental revenues include the Basic County-City Relief Tax, Supplemental County-City Relief Tax, motor vehicle property taxes, and fuel taxes. Basic County-City Relief Tax and Supplemental County-City Relief Tax are statewide sales and use taxes enacted to provide property tax relief. Basic County-City Relief Tax is a state-mandated, county-imposed sales and use tax returned to the county of origin, while revenues derived from the Supplemental County-City Relief Tax sales and use tax are pooled and distributed according to a specific formula.

The overlapping ad valorem tax rates of all entities imposed on property in the town of Eureka is $1.9926 per $100 of assessed valuation. This is among the lowest rates in the state and is 45 percent below the state-mandated maximum of $3.64. Eureka County's levy is $0.8488, 43 percent of the total (see **Table 3.17-9**). ECSD's levy is $0.75, a uniform statewide levy for public education. Other levies include $0.2153 for the town of Eureka, primarily for public works, a county-wide levy to support television service, and a state-mandated levy of $0.17, with proceeds dedicated to emergency medical care for indigent victims of motor vehicle accidents.

Table 3.17-9
Ad Valorem Tax Rates in the Town of Eureka for 2003/2004

Taxing Entity	Tax Rate
Eureka County	$0.8488
Eureka County School District	$0.7500
Eureka Town	$0.2153
State Indigent Health Care	$0.1700
Eureka County TV District	$0.0850
Total	**$1.9726**

Note: Rates are in dollars per $100 of assessed valuation.

Source: Eureka County, County Recorder/Auditor's Office 2003; Nevada Department of Taxation 2003***a***.

County-wide tax rates also apply to the net proceeds of mining. Such proceeds are taxed at a rate of $5 per $100 by the state. From the total, revenues equivalent to that which would have been derived by the local levy are returned to the county and school district of origin, the remainder being retained by the state.

Eureka County expenditures have increased sharply over the past 3 years, from $8.3 million in 2001/2002 to $9.2 million in 2002/2003 and $12.5 million for 2003/2004. The sharp rise in expenditures resulted largely from one-time grants and transfers from the county's reserves for regional transportation, building maintenance reserve, and other intergovernmental grants. Budgeted outlays of the major functions/departments for operating purposes reflect more modest changes (see **Table 3.17-10**). Expenditures for the judicial department, for example, climbed by $268,067 over the 3-year period, while those for public safety were cut by $333,652 during the same period. Community support and transfers to other government funds also posted substantial decreases in budgeted outlays (Eureka County, County Recorder/Auditor's Office 2003).

The County has a long-standing policy of refraining from the use of long-term debt for capital improvements. The policy of funding improvements using available resources reflects both the substantial revenues generated by mining and the uncertainty that surrounds the industry. While current mine plans of the existing mines indicate sufficient reserves to sustain operations beyond 2010, variability in the price of gold may affect production levels and net proceeds, in turn affecting the County's tax base. Such uncertainty, particularly given current revenues, makes long-term debt both unnecessary and somewhat risky.

Table 3.17-10
Eureka County Budgeted Expenditures for Fiscal Years 2002 to 2004

Function/ Department	Fiscal Years		
	2001/2002	2002/2003	2003/2004
General Government	$2,739,895	$2,700,197	$4,001,206
Judicial	$626,333	$713,031	$894,400
Public Safety	$1,647,852	$1,436,462	$1,314,200
Public Works, including Roads	$1,695,715	$2,506,168	$2,310,200
Welfare, Health, and Sanitation	$513,815	$509,613	$722,450
Culture and Recreation	$732,240	$697,346	$783,795
Community Support, Other, Intergovernmental, and Contingencies	$375,334	$663,919	$2,443,900
Total Expenditures	**$8,331,184**	**$9,226,736**	**$12,528,756**

Note: Budget data for 2001/2002 and 2002/2003 are actuals; data for 2003/2004 are budgeted.

Sources: Eureka County, County Recorder/Auditor's Office 2003 and 2004.

Eureka County School District

General fund revenues of the ECSD, like those of Eureka County, are subject to volatility tied to the mining industry. Historically, the ECSD has derived virtually all its revenue from locally generated ad valorem property taxes levied on real and personal property and the net proceeds of mining. Total revenue, which had peaked at $8.76 million in 1996, had declined to $4.13 million in 2001/2002 (**Table 3.17-11**). Ad valorem taxes accounted for 72 percent of the latter amount, with 85 to 90 percent of that tied to mining. In 2002/2003, ECSD qualified for supplemental state education funding for the first time in more than a decade, due to declining tax revenue associated with the mining industry. The infusion of state revenues contributed to ECSD's total revenues of $3.74 million that year. Locally-derived ad valorem tax revenues climbed by 53 percent for 2003/2004 due to the recent resurgence in the net proceeds of mining and value of mining property due to increased production and higher gold prices. Those gains were more than offset by reductions in state aid and federal revenues, such that total revenues fell to $3.57 million in 2003/2004.

Table 3.17-11
Eureka County School District Revenues

	Fiscal Year		
	2001/2002	2002/2003	2003/2004
Local			
Ad Valorem	$3,072,567	$1,992,082	$3,054,188
Other Local	$657,856	$536,091	$438,441
State	$195,828	$853,260	$50,100
Federal	$202,806	$359,990	$24,000
Other Sources	$300	$0	$2,000
Total Revenue	**$4,129,357**	**$3,741,423**	**$3,568,729**

Sources: ECSD 2003 and 2004.

The ECSD's changing economics, along with declining enrollments, have resulted in a challenging environment for the school board, District administrators, faculty, and staff as they collectively seek to maintain quality public education in Eureka County. As described above, the District's total staffing level has declined by one-third in the past 5 years, and its total annual expenditures budget declined by 44 percent, from $8.05 million in 1997/1998 to $3.74 million in 2002/2003 (**Table 3.17-12**). The cutbacks reflect the impact of falling enrollments on allowable expenditures, combined with the reduction in mine-related property tax revenue to fund discretionary programs, faculty, and other costs. Although some savings accrue to the ECSD as enrollments decline, ongoing costs associated with building operation and maintenance, transportation, salaries, and providing a core curriculum are more fixed or increasing. Average salaries paid by ECSD are among the highest in the state and are necessary to recruit and keep quality faculty given the remoteness of its schools, shortage of housing, and other factors. An increase in the number of junior/senior high students in Beowawe and Crescent Valley also has contributed to the increases in budgets, raising the amount of tuition paid to the Lander County School District and to higher transportation costs.

Table 3.17-12
Eureka County School District Expenditures

	Fiscal Year		
	2001/2002	**2002/2003**	**2003/2004**
General Fund			
Regular Programs	$2,128,683	$1,662,298	$1,748,180
Vocational and Other Programs	$858,225	$859,815	$256,745
Undistributed and Food Service	$2,384,373	$1,910,881	$2,265,080
Capital / Debt Service	$242,635	$242,414	$1,058,636
Total Expenditures	**$5,371,433**	**$4,675,408**	**$5,328,641**

Source: ECSD 2003 and 2004.

ECSD's total expenditures for 2003/2004 are budgeted at $5.3 million, an increase of $653,233 over the previous year (**Table 3.17-12**). Retirement of $1.06 million in outstanding debt by ECSD was the primary contributor to the increase as the total general fund expenditures for educational and vocational programs and District operations declined compared to the previous year.

ECSD has taken advantage of the economic prosperity associated with the resurgence of mining to undertake major capital improvements program, without incurring excessive long-term debt. A combination of capital reserves and intermediate-term debt were used to fund the construction of two elementary schools and other smaller projects. The ECSD has no debt outstanding, having retired approximately $1.05 million in principal last year, more than 4 years early. The ECSD obtained electorate approval in the 2004 general election to issue $6.0 million in long-term debt. Proceeds from the debt issuance will be used to renovate the high school, including replacement of three modular classroom units, and to finance other physical and mechanical plant improvements. The renovations are intended to address increasing utility and maintenance costs, integrate classroom spaces with the existing structure, and improve the overall functionality of the educational environment (Zunino 2004).

3.17.2 Environmental Consequences

3.17.2.1 Proposed Action

This section describes the impacts of the Proposed Action within the context of social and economic conditions of the primary study area, including the town of Eureka and surrounding areas of southern Eureka County. Where appropriate, changes affecting areas outside the region are noted. Both short-term impacts during construction and longer term impacts during operations and post-mining are described.

During a 4- to 6-month startup period, approximately 10 contract employees would work at the site. As that activity nears completion, Homestake would begin expanding its operations work force to an interim level of 94 workers as mining and processing begin. The work force would reach an anticipated peak of 128 workers in 2007, where it would remain into 2010. Thereafter, it would decline to 91 in 2012 following the completion of mining. Employment levels would decline to 5 to 20 workers during final gold recovery and reclamation in 2013 through 2015.

Employment, Economic, and Population Impacts

The local economy is dependent on mining, agriculture, tourism, and government for its economic base. The proposed project would result in temporary increases in local construction jobs and longer term increases in mining sector employment in Eureka County. Labor earnings in those industries would provide an economic stimulus to the local economy that is adjusting to economic contractions associated with the completion of mining at the existing Ruby Hill Mine and the completion of the construction of the Falcon to Gonder transmission line.

Expenditures made locally by Homestake and its employees and contractors would support increased local private- and public-sector employment in Eureka. Existing businesses, many of which rely heavily on seasonal receipts related to tourism and hunting, would benefit from the added year-round revenue. Some new businesses likely would start in Eureka, offsetting recent business closures in the town. However, much of the secondary economic activity supported by the mine expansion would occur outside the local economy due to the limited size and diversity of the local retail and service sectors and to sales leakage related to mine employees commuting from other communities. Businesses in Elko, Ely, and as far away as Reno, would capture most of the trade leakage.

The project's effects on the region's economy, population, and other aspects of the socioeconomic environment would depend on the number and demographic characteristics of in-migrating workers. In turn, the level of in-migration would be influenced by the local availability of qualified workers and the availability of housing.

Four potential sources of local labor for the mine expansion include persons who are unemployed, underemployed, employed at other mines but willing or desiring to change employers, and those living elsewhere in the region and willing to commute. As shown in **Table 3.17-13**, the size of the local labor force is limited. Despite having nearly 4,000 mining jobs within its borders, Eureka County is sparsely populated and the size of its work force is limited. Unemployment typically averages 50 to 60 individuals and is sensitive to seasonal variation and the influences exerted by a single employer or project, such as the construction of the recently completed Falcon to Gonder transmission line. That project absorbed much of the available labor from the surrounding region and attracted more individuals to participate in the labor force. At the same time, Eureka's remoteness and limited job opportunities limit the community's attraction to outsiders seeking employment, and those without jobs tend to relocate.

Table 3.17-13
Regional Labor Market Conditions – 2003 Annual Averages

County	Labor Force	Employed Persons	Unemployment	
			Persons	Rate (percent)
Elko	19,790	18,690	1,100	5.5
Eureka	740	700	40	5.6
Lander	2,020	1,880	140	7.1
White Pine	2,880	2,770	110	3.9
Regional Total	**25,430**	**24,040**	**1,390**	**5.5**

Source: Nevada Department of Employment, Training, and Rehabilitation 2004.

The broader northeastern Nevada region, delineated in **Table 3.17-13**, supports a substantially larger work force, with an average of nearly 1,400 unemployed persons in 2003. Although travel distances between communities in northeastern Nevada are great and serve to encourage miners to live close to the work site, long-distance commuting is not uncommon. According to the 2000 Census, 82 of the 712 employed residents in Eureka County reported their normal place of work as being outside the county, mostly in Elko, Lander, and White Pine counties. At the same time, over 70 percent of those working in Eureka County lived elsewhere.

Current work force commuting data are unavailable. However, a common local perception is that many households in the area have a wage earner who had been employed at the existing Ruby Hill Mine or another mine in the area that also has cutback or ceased operations, but now works elsewhere while waiting for improving economic conditions to create new job opportunities locally that would allow them to move back. The number of such workers, or whether their skills and other qualifications are appropriate to the opportunities supported by the proposed mine expansion, is not known. However, to the extent that the perceptions are accurate, these workers represent an important potential source of labor for the project.

These factors have been taken into account in the projected employment and population impacts of the proposed mine expansion in the primary study area. **Table 3.17-14** summarizes these impacts for mine start-up, operations, and reclamation.

Start-up. The project-related work force would average about 35 workers over a 4- to 6-month start-up period, 20 with Homestake and 15 associated with contractors. Most of the temporary contract jobs would require specialized skills and would be by non-local residents who temporarily would reside in the community.

Indirect employment created locally by the construction activity would be limited to about 7 jobs, due to the short duration and relatively few new jobs created. Including Homestake’s current employees, local labor is

Table 3.17-14
Projected Employment, Population, and Student Enrollment Impacts

			Start-up	Active Mining and Processing			Processing and Reclamation	
Line No.	Parameter	Source/Basis	2005	2005-2007	2007-2010	2010-2012	2012-1014	2014-2015
#1	Direct Jobs at Ruby Hill	Homestake	35	94	128	91	20	6
#2	Indirect Jobs Multiplier	Assumption	0.2	0.43	0.43	0.43	0.43	0.4
#3	Indirect Jobs	#1 x #2	7	40	55	39	9	2
#4	Total New Jobs in Eureka	#1 + #3	42	134	183	130	29	8
#5	Percent Available Local Labor Force	Assumption	60	20	20	20	20	20
#6	Jobs Filled By Local Labor	#5 x #4	25	27	37	26	6	2
#7	New Non-local Labor Needs	#4 - #6	17	107	146	104	23	6
#8	Average Jobs/Household	2000 Census	1.2	1.4	1.4	1.4	1.2	1.2
#9	New Resident Households	#7 / #8	14	76	104	74	19	5
#10	Average Household Size	Assumption	1.7	2.64	2.64	2.64	2.64	2.64
#11	Population Impact	#9 x #10	24	201	275	195	50	13
#12	Percent in Eureka	Assumption	100	95	95	95	95	95
#13	Eureka County Impact	#11 x #12	24	191	261	185	48	12
#14	School Age Children/Household	Assumption	0.3	0.8	0.8	0.8	0.8	0.8
#15	Number of Students	#14 x #9	4	61	83	59	15	4
	Grade Distribution							
#16	Elementary at 0.6	Assumption	2	37	50	35	9	2
#17	Middle/High School at 0.4	Assumption	2	24	33	23	6	2

expected to meet about 40 percent of the total jobs during start-up. As a result, the net employment impact during start-up would not be substantial.

Direct payroll to the company and contractor work forces during start-up, excluding the value of benefits, is projected at $766,000. A substantial share of that sum would be spent locally for items such as food, clothing, fuel, and rent, thereby stimulating the local economy.

Many of the temporary workers are likely to already be residents of the surrounding region, commuting on a weekly basis but maintaining their permanent residence elsewhere. Most would be unaccompanied by friends, spouses, or families. Consequently, the projected short-term impact would be 36 temporary residents and 4 additional children enrolled in the public schools. Housing needs for these workers likely would be met by a combination of local motel rooms and worker-owned recreational trailers parked at one of the recreational vehicle (RV) parks in Eureka. These impacts would not be substantial within the context of the current population, enrollment, or housing supply.

Operations. Operations employment at the proposed mine expansion is anticipated to range between 91 and 128 jobs over the long term, averaging 112 jobs between late 2005 and 2011. According to estimates prepared using the IMPLAN model, a nationally recognized economic impact model used in economic development and resource planning, each new mining job would support another 1.7 jobs in northeastern Nevada (Minnesota IMPLAN Group [MIG] 1999). Those jobs would be in mining services, wholesale and retail trade, government, transportation, construction, and other sectors of the economy. For the mine expansion, a local secondary multiplier of 0.43 jobs is assumed (25 percent of the total), to account for the projected trade leakages to Elko and other communities. The adjusted multiplier yields between 39 and 55 additional indirect jobs and total employment of between 130 and 183 jobs during operations. The peak operations employment impact represents a 4.5 percent increase over Eureka County's 2002 employment on a place-of-work basis, but a 26.1 percent increase compared to the current employed resident work force of 700 in Eureka County.

For this analysis, the existing labor force is assumed to meet 20 percent of the total long-term demand, or 37 jobs. That total includes individuals in nearby communities who choose to commute to jobs in Eureka rather than relocate. The residual unmet labor need of 146 jobs would be filled through in-migration. With an average of 1.4 jobs filled per new household, 104 additional households are projected to migrate to the area. Based on an average household size of 2.64 persons per household, characteristic of the county’s population during the 2000 census, the corresponding net population impact would be 275 additional persons.

At full production, annual earnings paid to the mine's employees are estimated at $6.68 million, with added payroll-related costs of $2.34 million annually for fringe benefits and other employer overhead. Over the life of the project, the total direct payroll associated with the mine expansion is estimated at $43.5 million.

Each $1.00 in local earnings in the mining sector would support $1.20 in earnings to other workers in northeastern Nevada (MIG 1999). An estimated $0.22 of that total would accrue in Eureka County. Consequently, the annual indirect impact on earnings would be $1.47 million during full operations and $9.57 million over the life of the project. The combined direct and indirect impact on local income during full production would be $8.15 million per year in Eureka County. Earnings supported by the proposed mine expansion would be equivalent to 21.1 percent of the total personal income of $38.6 million by Eureka residents in 2002, a substantial beneficial impact accruing to households and businesses alike. With the higher income and spending, some new businesses likely would start in Eureka, providing economic expansion and diversification. Furthermore, the improved economic climate could create additional investment in Eureka's business district. Such investment has been lacking, as most new investment has been by the public sector.

Reclamation. Employment, income, and population impacts associated with the Proposed Action would decrease over time as mining is completed and final reclamation proceeds. Direct employment is projected at 20 in 2013, declining to 6 jobs in 2015, the final year of activity. Changes in income and population impacts would track the declines in employment.

Housing

Short-term housing demands during the start-up phase could be met via a combination of weekly and monthly rentals of motel rooms and RV/trailer spaces in Eureka. There are in excess of 100 rooms and spaces in Eureka. These accommodations, which served higher and lengthier demands associated with the recently completed Falcon to Gonder transmission line, should be adequate to meet the temporary demands of the mine expansion.

More severe pressure on local housing would occur during the operations phase. Additional demand is estimated at 76 new households through 2007, climbing to 104 households through 2010, before declining as the work force scales back. The increase in demand would be substantial in that it would be equivalent to 10 percent of the total existing housing recorded in Eureka County during the 2000 census.

Local housing availability currently consists of vacant units at Homestake’s previously constructed 30-unit housing subdivision, an estimated 20 to 30 vacant existing apartments, mobile homes and dwelling units, spaces at mobile home/RV parks, and developable lots and acreages in town and the surrounding area. Combined, these units and spaces represent a potential supply of 150 to 160 units. However, converting this potential into actual supply would require a combination of new construction and moving in new or previously owned mobile and modular homes. Mortgage lenders and modular/mobile home dealers to facilitate the process are located in Battle Mountain, Ely, and Elko.

The increase in demand would inflate housing purchase and rental costs above recent levels. However, those costs have been depressed by the lack of demand following earlier cutbacks in local mining operations and completion of the transmission line construction. It is anticipated that rising housing costs would induce more households to commute from other locations, including Crescent Valley, Austin, and Ely.

Community Facilities and Services

Public Safety. Project-related growth would affect local public safety services. The sheriff foresees the need for two additional patrol officers and one administrative position during the life of the project. These needs are based on an expected rise in the number of calls for assistance and traffic accidents. These staff changes would increase the department's payroll, operating, and capital equipment costs. The added personnel would allow expanded patrol coverage in Eureka, though 7-day-a-week, 24-hour coverage by a patrol officer still would not be achieved. In addition, the sheriff is concerned that the project's effect on housing cost and availability would further hamper recruitment and retention. It is anticipated that existing detention facilities would be adequate to accommodate demands (Black 2004; Sanders 2004).

It is anticipated that the increase in employment, population, and development would increase the number of calls to the Eureka Volunteer Fire and Emergency Medical Services. The increased demand would not strain the equipment capabilities of the respective service agencies; however, it would place added pressure on the department's volunteers. At the same time, both services benefited from an increase in the number of active volunteers during operation of the existing Ruby Hill Mine, and it is expected that this would occur again. With round-the-clock operations at the mine, an added benefit is that some of the mine's work force scheduled for night shifts would be more likely to be available to respond to calls during the day, a time when many other volunteers are at work. Coordinated safety and emergency response training between the mine and both services, which occurred previously and likely would be re-initiated, would enhance overall preparedness and response that would benefit the community as a whole (Marshall 2004; Rebaleati 2004).

Public Education. Enrollment in the ECSD initially would experience little change as a result of the mine expansion as most of the temporary workers involved with plant or equipment assembly either would be unmarried or not accompanied by families during the relatively brief start-up period. A net increase of 4 students is projected during the latter half of the 2004/2005 school year.

As overburden removal and active mining is initiated, it is anticipated that as many as 55 additional students would enroll in Eureka County schools during the 2005-2006 school year. The increase would be substantial relative to the total district enrollment of 220 in the recently completed 2003-2004 school year. Average class sizes would climb as a result of the enrollment growth, and, depending on the age distribution of the students, the District may need to add a class of a specific elementary grade. The higher enrollment also may support the District hiring two to four additional faculty and staff. The additional staff would support expanded curriculum and relieve burdens on administrative staff created by cutbacks in staffing that occurred in recent years in response to declining enrollment. A graphical summary of projected enrollment increases is presented in **Figure 3.17-2**.

It is anticipated that project-related enrollment would climb to an estimated 75 students at full production between 2007 and 2010. Although the age-distribution of the new students is uncertain and would vary over time, elementary students are expected to account for approximate 60 percent of the new students. For the proposed mine expansion, this would translate into approximately 45 elementary (K through 6) and 30 secondary (7 through 12) students (see **Table 3.17-14**). The incremental increase in enrollment may warrant expanding the District's staff by 3 or 6 additional faculty members and support staff, above and beyond staffing increases made in response to the earlier enrollment growth, either to limit increases in elementary class sizes or provide additional specialists to enhance the curriculum.

Even with the added students, the District's enrollment would be well below the peak enrollment of 358 students in 1999 and the physical capacity of the District's existing facilities. The District is embarking on renovations and other improvements of those facilities, funded by the proceeds of a $6.0 million bond issue approved by local voters in the 2004 general election.

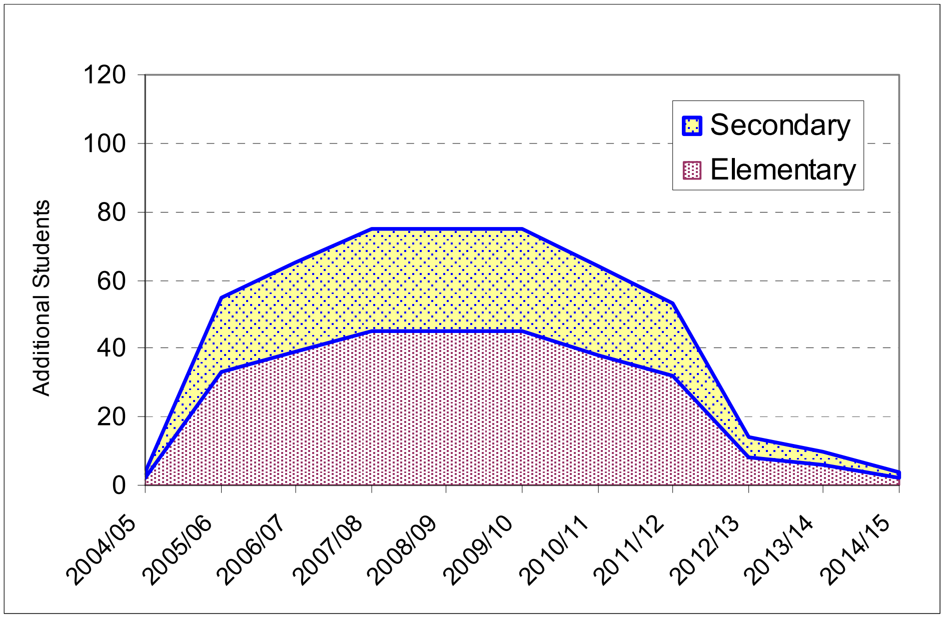


Figure 3.17-2. Projected Eureka County School District Enrollment Increases

Health Care and Social Services. It is anticipated that the project-related population growth would be double the health clinic's caseload above the current 12 to 18 visits per day. The added demand would not strain the capacities of the current facility or staff, but rather is viewed as promoting better utilization, proficiency, and improving the financial conditions of the Nevada Rural Health Council as the mine employees and their families would be covered under an health insurance program (Nanton 2004). Some retraining or updated training would be needed to support mine safety training and hearing/vision checks. The increased demand may prompt more frequent visits by the dentist who currently practices in Eureka approximately once per month. If this were to happen, all residents of the region would benefit.

Utilities. The current water system in the town of Eureka could handle a 75 percent increase in peak consumption without requiring expansion, and the town has additional water rights, if needed. The lagoon-based wastewater system also is currently operating with substantial surplus capacity. Both systems met the higher demands associated with the original Ruby Hill Mine, while still retaining adequate reserve capacity. Thus, the utility systems would not experience adverse demands under the Proposed Action (Damele 2004). The additional user revenues would improve the financial conditions of the utility enterprises.

Library. Population growth associated with the proposed mine expansion would increase demands on the public library. However, the existing facility would be adequate to handle the additional patronage.

Recreation Facilities. Under the Proposed Action, local recreation programs, the community swimming pool, and athletic facilities maintained by the county and ECSD would be adequate to meet increased demand.

County Administrative Facilities. Eureka County completed an extensive program of facility expansion and renovation in the mid-1990s. As a result of these efforts, the County's administrative facilities have adequate capacity to accommodate project-related demand (Damele 2004).

Public Sector Fiscal Conditions

The Proposed Action would affect public sector revenues, both directly and indirectly, during the life of the project. Added revenues would be generated, and public sector costs would rise to meet the added demand. Eureka County and the ECSD would be the two jurisdictions most directly affected. Both entities would receive additional tax revenues as a result of the Proposed Action, primarily from general property and net proceeds. The County also would benefit from increases in sales and use and motor vehicle fuel taxes.

Given the limited impacts on public services and staffing, the increased revenues accruing to the County over the life of project are expected to more than offset the incremental costs of serving the added demands of a larger population. Applying the County's current $ 0.8458 per $100 tax rate to the estimated taxable valuation of property and equipment and projected net proceeds of $70 per ounce of gold produced yields estimated total ad valorem tax revenue of $1.2 million over the life of the project.[1] Additional revenues would accrue to the County in the form of sales and use and other taxes and fees associated with new equipment purchases by the mine and its ongoing operations and expenditures by its workers and other businesses and households supported by the project. Though detailed estimates of these other revenues are not available, such revenue reasonably could be expected to equal the property and net proceeds tax receipts derived from the mine, thereby yielding a total revenue of $2.4 million over the life of the project.

Offsetting the increased revenues would be higher public outlays to meet the added demands. No specific capital infrastructure needs have been identified in connection with the Proposed Action. The possible hiring of several additional deputies and administrative staff for the sheriff are the only identified personnel needs to meet increased demand. Even assuming four additional staff are hired at an assumed average annual cost of $50,000 per position (salary, benefits, and other associated costs), the total projected outlay over the 7 years of project operations would be of $1.6 million. That sum would be equivalent to 67 percent of the reasonably expected revenues, yielding a net surplus to the County over the life of the project.

For the ECSD, the projected incremental ad valorem property tax and net proceeds revenues would exceed $1 million over the life of the project. The District also would gain additional motor vehicle privilege and miscellaneous revenues, including limited enrollment or special program-based federal funds. Thus, the total project-related revenue is estimated at $1.1 to $1.2 million over the life of the project.

As discussed under Public Education, project-related enrollment increases of as many as 75 students may warrant 3 to 6 additional faculty and staff positions. Depending on the number of positions added, the added annual payroll and operating costs could range between $200,000 and $400,000 per year at full production.

[1] The assumed $70 per ounce net proceeds basis is based on an analysis of smaller mines (i.e., under $100 million in gross proceeds) operating in Nevada over the past several years and reflects an average gold price of $350 and a gross production cost of $280 per ounce.

Local voters approved a $6.0 million bond issue in the 2004 general election for the ECSD. Real property and net mining proceeds associated with the proposed mine expansion would be subject to a debt service levy of $0.1625 per $100 of assessed value. Over the life of the project, that levy would yield approximately $232,000 in revenue for debt service on the bond.

Tax receipts of the State of Nevada also would increase under the Proposed Action. Sales and use taxes and net proceeds taxes would be the two primary sources of such revenues.

Social Attitudes and Lifestyles

Local attitudes and opinions about the project were explored during informal interviews and discussions with local officials, business operators, and other residents. These discussions reveal that the proposed mine expansion generates broad and varied public reaction ranging from casual indifference to concern.

The former appears to reflect awareness and an understanding that mining and its periodic expansion and contraction cycles are part of the area's history, present, and likely an important part of its future. As such, changes and impacts are viewed as challenges or problems requiring individual, community, and institutional responses. In part, this perspective reflects the community's recent experience with, and knowledge of, the existing Ruby Hill Mine. That experience generally is described as positive or favorable, with improvements in local housing, public infrastructure, and public services made available to respond to the added demand. However, it also is predicated on local expectations of a continued positive and open relationship between the mine, local government, and the community.

Anticipation toward the proposed mine expansion generally arises in the context of the potential economic benefits associated with the project including job opportunities, increased trade for local merchants, and higher public sector revenues. That anticipation also extends to some of the demographic and social impacts as well, including for instance, additional students in the school system and the expected increases in the number of active members of the Eureka VFS.

Concerns regarding the proposed mine expansion are related to the potential impacts of the mine expansion on groundwater resources that provide potable water for Eureka, the Devil's Gate Improvement District, and agricultural water for livestock watering and crop irrigation. The concern over the potential impacts on groundwater takes on an added social dimension because agriculture is viewed by some as the long-term economic foundation and future of Eureka County. Thus, the agricultural community is heavily vested in issues related to the supply, use, and quality of local water resources.

3.17.2.2 No Action Alternative

The No Action Alternative would preclude development and operation of the proposed mine expansion. However, ongoing operations (mineral processing) and final reclamation at the existing Ruby Hill Mine would continue to completion (through 2006). Thus, both the beneficial and adverse socioeconomic impacts associated with the mine expansion described in Section 3.17.2.1, Proposed Action, would not occur. Existing conditions and trends, characterized by declining operations at the existing Ruby Hill Mine and limited growth and development in southern Eureka County, would continue. The potential impacts associated with the existing Ruby Hill Mine are described in detail in the Ruby Hill Project Final EIS (BLM 1997a).

Between 130 and 183 long-term jobs and the incomes for local and in-migrating residents in association with the proposed mine expansion would be foregone. The proposed project's added indirect economic stimulus and beneficial effects on the region's economic development and diversification would not occur, thereby foregoing the added spending to support existing and new businesses in the local and regional economies. As there is little other new business or industrial activity occurring in southern Eureka County, there are no constraints or other competition for resources that would be avoided under the No Action Alternative. Therefore, the benefits foregone would represent net losses.

Homestake currently employs a small work force of 13 at the existing Ruby Hill Mine. That work force is associated with on-going mineral recovery from the existing heap, conducting environmental monitoring, and plant maintenance.

Demand for local housing would not increase. Weak market conditions for existing housing, which characterize the current conditions in the wake of the earlier and future cutbacks at the existing Ruby Hill Mine, other past mining projects, and the completion of a transmission line construction project would persist, limiting the resale opportunities for existing owners. Further additions to the local housing stock, both in terms of quantity and quality, would be foregone, as would be the inflationary pressures on rents and values of existing homes.

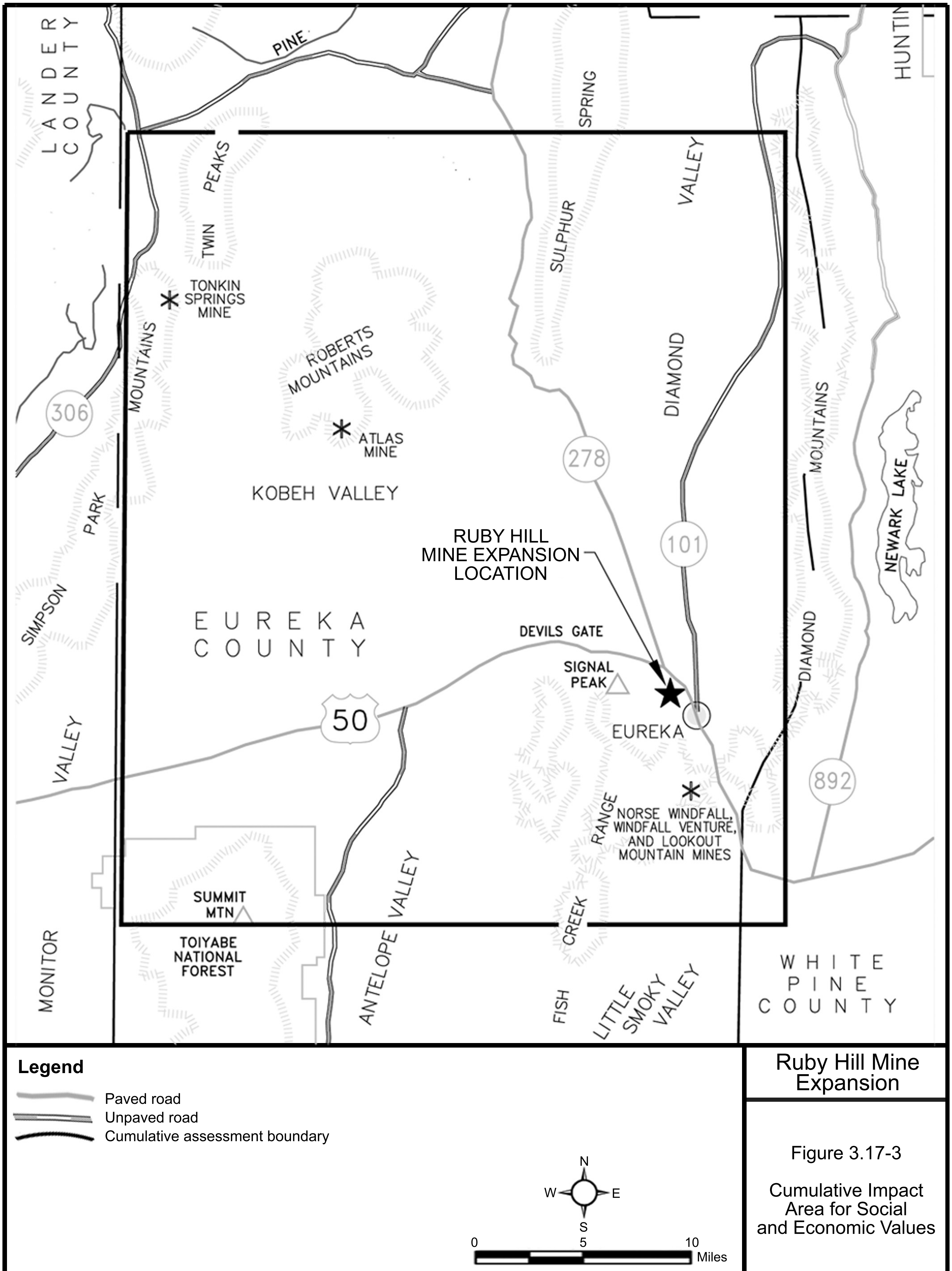
Additional population growth and increased demands on local law enforcement, public works, and other entities would be avoided. The ECSD would not experience the projected mine expansion-related influx of as many as 83 new students in its schools in Eureka. That increase would be viewed as an adverse impact in that it would not allow the District to regain some of the staff positions and program offerings that have been lost due to enrollment declines in recent years.

Fiscal conditions of local public entities would not realize the additional revenues and costs directly and indirectly associated with the proposed project, and revenues associated with the existing Ruby Hill Mine would decline. As many as 10 new public service employment opportunities would not be created. Over the life of the proposed project, the county and school district would forego a combined total of nearly $7.0 million in revenues, while avoiding a projected $5.5 million in expenditures to meet the additional service demands.

3.17.3 Cumulative Impacts

The cumulative impact area for social and economic values is shown in **Figure 3.17-3**. Interrelated projects are identified in **Table 2-9**. Interrelated projects in the social and economic cumulative impact area include ongoing operations at the existing Ruby Hill Mine and Homestake's ongoing exploration in the vicinity of the mine, as well as past actions as discussed above. Cumulative social and economic impacts are functions of the timing, scale, and scope of the specific activities.

Cumulative social and economic impacts between the existing Ruby Hill Mine and Falcon to Gonder transmission line project were very minor and principally beneficial in nature. The construction activity



Ruby Hill Mine Expansion

Figure 3.17-3

Cumulative Impact Area for Social and Economic Values

10/29/04

employed a substantial number of individuals, including many residents, and had a major staging area in Eureka. As a consequence, the project generated short-term demand on housing as well as business and consumer spending in local businesses. That demand occurred between the time the original Ruby Hill Mine ceased mining operations and the renewed permitting activity for the proposed mine expansion. As such, the transmission line project provided an important economic stimulus into the local community. That project is completed, with little or no residual social and economic impacts that would interact with those of the proposed mine expansion.

Exploration requires relatively few employees and often occurs intermittently over time. Such activities generate temporary demands on housing, other community resources, and public fiscal resources. If future mineral exploration activities coincide with the start-up and operations periods of the proposed mine expansion, the adverse impact on housing would be temporary and short-term in nature.

Other potential cumulative impacts could include demands on local public safety, emergency medical providers, and the ECSD. Public sector fiscal resources would not be substantially affected by exploration, as such activities generate limited revenues or needs for public expenditures.

3.17.4 Mitigation and Monitoring

Issue: Potential impacts on the Eureka County infrastructure, services, and fiscal planning processes as a result of unanticipated project changes.

Measure SE1: Homestake should maintain its ongoing communications and coordination efforts with Eureka County and the ECSD to provide as much advance notice as possible of unforeseen changes.

Effectiveness: Coordination efforts between Homestake and Eureka County and the ECSD would minimize potential impacts to the Eureka County and ECSD infrastructures.

3.17.5 Residual Adverse Impacts

Residual adverse impacts to public infrastructure and services, local housing, and the local economy would be minor and short term.

3.18 Hazardous Materials and Solid Waste

The study and cumulative impact areas for waste, hazardous or solid, are the existing Ruby Hill Mine site and the proposed expansion areas, as well as SR 278 and the portion of U.S. Highway 50 between SR 278 and the access road to the mine site.

3.18.1 Affected Environment

The affected environment for hazardous materials includes air, water, soil, and biological resources that potentially could be affected by an accidental release of hazardous materials during transportation to and from the mine and during storage and use at the mine.

Although there are no mining operations ongoing at the project site at this time, mineral processing activities are continuing. In addition to the existing Ruby Hill Mine, the Eureka area has a history of mining activities including lead smelting operations. There is no record of releases of hazardous substances from these prior or current activities.

3.18.1.1 Project-related Hazardous Materials

The mining and ore processing operations at the proposed expansion would require the use of the following materials classified as hazardous:

- Diesel fuel, gasoline, oils, greases, anti-freeze, and solvents used for equipment operation and maintenance;
- Sodium cyanide, sodium hydroxide, acid, flocculants, lime, and antiscalants used in mineral extraction processes;
- Ammonium nitrate and high explosives used for blasting in the open pit; and
- Various by-products classified as hazardous waste and chemicals used in the assay laboratory.

3.18.1.2 Regulatory Definitions of Hazardous Substances

"Hazardous materials," which are defined in various ways under a number of regulatory programs, can represent potential risks to both human health and the environment, when not managed properly. The term hazardous materials includes the following materials which may be utilized or disposed of in conjunction with mining operations:

- Substances covered under OSHA Hazard Communication Standard (29 CFR 1910.1200): The types of materials that may be used in mining activities and which would be subject to these regulations would include almost all of the materials identified above.
- “Hazardous materials" as defined under USDOT regulations at 49 CFR, Parts 170-177: The types of materials that may be used in mining activities and which would be subject to these regulations would

include sodium cyanide, explosives, cement, fuels, some paints and coatings, and other chemical products.

- “Hazardous substances” as defined by CERCLA and listed in 40 CFR Table 302.4: The types of materials that may contain hazardous substances that are used in mining activities and which would be subject to these requirements would include sodium cyanide, solvents, solvent-containing materials (e.g., paints, coatings, degreasers), acids, and other chemical products.

- “Hazardous wastes” as defined in the Resource Conservation and Recovery Act: Procedures in 40 CFR 262 are used to determine whether a waste is a hazardous waste. The types of materials used in mining activities and which could be subject to these requirements could include liquid waste materials with a flash point of less than 140°F, spent solvent-containing wastes, corrosive liquids, and lab assay wastes.

- Any “hazardous substances” and "extremely hazardous substances" as well as petroleum products such as gasoline, diesel, or propane, that are subject to reporting requirements (TPQs) under Sections 311 and 312 of SARA: The types of materials that may be used in mining activities and which could be subject to these requirements would include fuels, coolants, acids, and solvent-containing products such as paints and coatings.

- Petroleum products defined as "oil" in the Oil Pollution Act of 1990: The types of materials used in mining activities and which would be subject to these requirements include fuels, lubricants, hydraulic oil, and transmission fluids.

In conjunction with the definitions noted above, the following lists provide information regarding management requirements during transportation, storage, and use of particular hazardous chemicals, substances, or materials:

- The SARA Title III List of Lists or the Consolidated List of Chemicals Subject to EPCRA and Section 112(r) of the Clean Air Act.

- The USDOT listing of hazardous materials in 49 CFR 172.101.

Certain types of materials, while they may contain potentially hazardous constituents, are specifically exempted from regulation as “hazardous wastes.” Used oil, for example, may contain toxic metals, but would not be considered a “hazardous waste” unless it meets certain criteria. Other wastes that might otherwise be classified as hazardous are managed as “universal wastes” and are exempted from hazardous waste regulation as long as those materials are handled in ways specifically defined by regulation. An example of a material that could be managed as a universal waste is lead-acid batteries. As long as lead-acid batteries are recycled appropriately, requirements for hazardous waste do not apply.

Pursuant to regulations promulgated under CERCLA, as amended by SARA, release of a reportable quantity of a hazardous substance to the environment must be reported within 24 hours to the National Response Center (40 CFR Part 302). The Nevada Administrative Code (445A.347) also requires immediate reporting of a release of a reportable quantity of a hazardous substance to the Nevada Division of Emergency Management. In addition, under the State of Nevada Water Pollution Control Permit program, all releases of a reportable quantity must be reported as soon as possible, but not later than 24 hours after the event, to the NDEP Bureau of Corrective Actions.

Incidental spills of hazardous substances have occurred during previous mining and mineral processing operations at the project site. All reported spills have been mitigated, and contaminated materials have been disposed of in accordance with federal and state regulations.

3.18.2 Environmental Consequences

3.18.2.1 Proposed Action

Project-related Hazardous Materials

As noted above, the Proposed Action would require transporting, handling, storing, using, and disposing of materials classified as hazardous under various regulatory frameworks. All hazardous materials would be shipped to and from the site in accordance with applicable USDOT hazardous materials regulations. All shipping containers and vehicles would be USDOT-approved for that material. The rate of use and storage volumes of these substances are listed in **Table 2-5**. A brief description of the storage, use, and spill response for hazardous materials during the Proposed Action is presented in Section 2.3.13, Hazardous Materials and Solid Waste.

Impact Analysis

Important issues related to the presence of hazardous materials at the proposed facility are the potential impacts to the environment from an accidental release of hazardous materials during transport to the project area or a release related to use or storage at the site. The criterion for evaluating hazardous materials impacts is the risk of a potential spill and associated impacts to sensitive receptors along transportation routes or exposure pathways.

If some of the chemicals identified for use during the life of the proposed expansion were to enter the environment in an uncontrolled manner, there could be associated direct or indirect adverse effects. The environmental effects of a release would depend on the substance, quantity, timing, and location of the release. The event potentially could range from a minor oil spill on the project site where cleanup equipment would be readily available, to a severe spill during transport involving a large release of sodium cyanide solution. Some of the chemicals could have immediate, but short-term destructive effects on aquatic resources and water quality if spills were to enter water ways such as the Humboldt River. Spills of hazardous materials could seep into the ground and contaminate the local groundwater. Depending on the proximity of such spills to populated areas or the use of degraded water for human consumption, such accidental spills could affect human health.

Transportation

Trucks would be used to transport hazardous materials to the project site. Based on the quantity, number of deliveries, and potential hazard, the materials of greatest concern would be sodium cyanide solution, sodium hydroxide solution, and diesel fuel. These chemicals most likely would be supplied from Elko and Carlin, Nevada, located approximately 115 miles from the project site. The most likely transportation route would be west on I-80 to Carlin and south on SR 278 to U.S. Highway 50 to the project access road. The route would pass through the community of Carlin. The Humboldt River and Pine Creek also would be crossed along this route. The analysis of transportation hazards would be confined to trucking along SR 278 (approximately 90 miles of the route) and would not consider I-80, where project-related trucks would be a very small percentage of the total truck volume.

Based on the annual consumption rates shown in **Table 2-5**, an approximate load delivery frequency for the materials can be determined. If all sodium cyanide was delivered in solution form, approximately 23, 20-ton loads of sodium cyanide would be delivered each year. If sodium hydroxide was delivered in liquid form, approximately 25, 10-ton loads would be delivered each year. Diesel fuel use would require approximately 467, 6,000-gallon shipments per year. Over the 7-year operating life of the mine (not including final reclamation), there would be approximately 161 shipments of sodium cyanide, 175 shipments of sodium hydroxide, and 3,269 shipments of diesel fuel.

In order to evaluate the potential impact of the transportation of hazardous materials to the mine site, the risk of a transportation accident resulting in a release of hazardous materials was estimated. Accident rates were derived from national statistics for truck accidents that involve hazardous materials as published by the Federal Motor Carrier Safety Administration (Battelle 2001). Accident rates estimated below vary for different categories of hazardous materials and are based on 1996 data and include accidents involving releases and non-releases of hazardous cargo. The accident rate involving the category of toxics or poisons such as sodium cyanide is 0.50 per million miles traveled. The accident rate for corrosive materials such as sodium hydroxide is 0.23 per million miles traveled. The accident rate involving flammable materials (including diesel fuel) is 0.13 per million miles traveled. Using these rates, the potential number of transportation-related incidents for these three materials occurring over the life of the project is shown in **Table 3.18-1**.

Table 3.18-1
Potential Number of Mine-related Transportation Accidents Involving a Release

Material	Number of Shipments	Distance (miles)	Accident Rate per Million Miles[1]	Calculated Number of Accidents (distance x accident rate)	Probability of Release per Accident[2]	Calculated Number of Releases
Sodium Cyanide	161	14,490	0.50	0.0072	0.36	0.0026
Sodium Hydroxide	175	15,750	0.23	0.0036	0.30	0.0011
Diesel Fuel	3,269	294,210	0.13	0.0382	0.28	0.0107

[1] Includes release and non-release accidents.
[2] Releases during accidents; does not include loading and unloading incidents.

Source: Battelle 2001.

The above analysis indicates that there would be a low probability of an accident involving the release of hazardous materials during the life of the Proposed Action.

All hazardous substances would be transported by commercial carriers or vendors in accordance with the requirements of Title 49 of the CFR. Carriers would be licensed and inspected as required by NDOT and USDOT. Tanker trucks would be inspected and would have a Certificate of Compliance issued by the Nevada Motor Vehicle Division. These permits, licenses, and certificates are the responsibility of the carrier. Title 49 of the CFR requires that all shipments of hazardous substances be properly identified and placarded. Shipping papers must be accessible and must include information describing the substance, immediate health hazards, fire and explosion risks, immediate precautions, fire-fighting information, procedures for handling leaks or spills, first aid measures, and emergency response telephone numbers.

In the event of a release off the project site, the transportation company would be responsible for response and cleanup. Each transportation company is required to have an emergency response plan to address spills and accidental releases of hazardous materials. Local and regional law enforcement and fire protection agencies also may be involved initially to secure the site and protect public safety. Title 49 of the CFR requires that the carrier notify local emergency response personnel, the National Response Center (for discharge of reportable quantities of hazardous substances), and the USDOT in the event of an accident involving hazardous materials.

Storage and Use

Homestake has developed a SPCC Plan in accordance 40 CFR Part 112, which describes the required level of containment and safety measures associated with storage, handling, and spill clean-up of oil (includes but not limited to petroleum, fuels, sludge, used oil, and mineral oil). Operations conducted in accordance with the SPCC Plan would ensure that impacts from spills would be minimized and the spilled materials contained and removed. Homestake would have the necessary spill containment and cleanup equipment available at the site, and personnel would be able to quickly respond.

Particular provisions of a SPCC Plan include the following:

- A prediction of the direction, rate of flow, and total quantity of oil spilled from any point where there is a reasonable potential for equipment failure.

- Appropriate containment and diversionary structures including berms, containment ponds, retaining walls, and collection systems.

- A commitment of manpower and equipment to expeditiously control oil that is released in “harmful quantities.”

- A complete discussion of all regulations and procedures that apply to facility drainage, bulk storage tanks, facility transfer operations, pumping and in-plant processes, facility tank truck loading/unloading operations, inspections and records, security, and personnel training requirements.

In the event of a major or minor spill of hazardous materials occurring on site, Homestake has prepared an Emergency Response and Contingency Plan that establishes procedures for preventing, controlling, and reporting environmental releases within or from facilities located at the Ruby Hill Mine. The Emergency Response and Contingency Plan is required to contain the following information in addition to general information concerning the facility and emergency response procedures:

- A hazard evaluation;
- Response planning levels;
- Facility response training drills/exercises;
- Description of discharge protection systems;
- The identity and telephone number of the designated qualified individual having authority to implement removal activities;
- The identity of individuals to be contacted;
- A description of information to be passed to response personnel;
- A description of response equipment and location;
- A description of response personnel capabilities and duties;
- Evacuation plans as appropriate;
- A description of immediate containment measures; and
- A diagram of the facility.

The existing processing facilities, which would be used under the Proposed Action, were designed to minimize the potential for an upset that could result in a major spill. This facility is described in detail in the Ruby Hill Project Final EIS (BLM 1997a) and summarized in Chapter 2.0 of this SEIS. The SPCC Plan and the Emergency Response and Contingency Plan would continue to be in place to provide the structures, procedures, and training to minimize the impacts of spills of hazardous materials.

All hazardous substances would be handled in accordance with applicable MSHA or OSHA regulations (Titles 30 and 29 of the CFR). The hazardous materials to be used under the Proposed Action would be handled as recommended on the manufacturer's MSDS. Based on the facility's design features and the operational practices in place, the probability of a major release occurring at the site during the life of the proposed mine expansion would be low.

Disposal

Assay lab wastes, consisting of slag, crucibles, and cupels, either would be introduced into the production circuit or disposed of off site at an approved facility. All hazardous waste generated at the mine (including any liquid lab wastes that meet the hazardous waste criteria) would be transported to licensed disposal facilities in accordance with applicable federal and state regulations. Used petroleum oil either would be used to heat shop buildings or recycled off site.

Potential Effects of a Release

The environmental effects of a release would depend on the material released, the quantity released, and the location where it is released. The accident/release statistics presented in **Table 3.18-1** assume an accident involving a hazardous material transporter, but do not address volume or location. Potential releases could include a small amount of diesel fuel spilled during transfer operations at the mine site or the loss of several thousand gallons of sodium hydroxide, diesel fuel, or sodium cyanide into a riparian drainage, such as the Humboldt River. In general, the materials of greatest concern would be sodium cyanide, sodium hydroxide, and diesel fuel.

A large-scale release of fuel, corrosives, or cyanide would have implications for public health and safety. The location of the release would again be the primary factor in determining its importance. A release in a populated area could have effects ranging from simple inconvenience during cleanup to potential loss of life if an explosion and fire were involved. However, the probability of a release anywhere along a transportation route is very small; the probability of a release within a populated area is smaller; and the probability of a release involving an injury or fatality is smaller still. USDOT statistics show that for the State of Nevada between 1983 and 1992, an average of 0.03 injuries or deaths occurred for each hazardous materials highway incident (USDOT 1993). It is not anticipated that a release involving severe effects to human health or safety would occur during the life of the project. None of the process chemicals or fuels to be use in large quantities are carcinogenic. No increases in cancer risk as a result of a release or mining activity are expected.

The release of a hazardous material or waste into a sensitive area (such as stream, wetland, or populated area) is judged to be very unlikely. Again, depending on the material released, the amount released, and the location of the release, an accident resulting in a release could affect soils, water, biological resources, and people.

Response to a Release

All spills, including transportation and loading/unloading spills occurring on site, would be cleaned up as soon as possible. If a spill exceeds reportable quantities, it would be reported to the Nevada Division of Emergency Management, NDEP, Bureau of Mining Regulation and Reclamation, USEPA, National Response Center, BLM, and Eureka County Emergency Response Coordinator.

In the event of a release en-route to the mine site, the transportation company would be responsible for response and cleanup. Law enforcement and fire protection agencies also may be involved to initially secure the site and protect public safety.

Hazardous materials transporters are required to maintain an emergency response plan which details the appropriate response, treatment, and cleanup for a material spilled onto land or into water. For example, a release of hydrochloric acid could require neutralizing the spill with lime, flushing the area with water, or removing contaminated soil. Specific procedures would be developed for fuels, acids, and other hazardous materials. Any cleanup would be followed by appropriate restoration of the disturbed area, which could include replacing removed soil, seeding the area to prevent erosion, and the return of the land to its previous use.

3.18.2.2 No Action Alternative

Under the No Action Alternative, the proposed mine expansion would not be developed. However, the transport, storage, use, and disposal of hazardous materials for the ongoing processing of ore at the existing Ruby Hill Mine would continue until recovery has been completed. The type and frequency of hazardous materials shipments would be reduced during final reclamation. Since active mining has been completed at the exiting operation, the number of shipments of fuels and oils would be lower than under the proposed mine expansion. However, the number of shipments of process chemicals per year would be similar to that proposed for the mine expansion, until processing has been completed. As a result, the potential transportation accident/release rate for this alternative would be slightly lower and shorter in duration than for the Proposed Action.

3.18.3 Cumulative Impacts

The cumulative impact area for hazardous materials includes the mine site and the portion of SR 278 between I-80 and the mine site. The storage and use of hazardous materials for the mine expansion would be nearly the same as that of the prior Ruby Hill Mine operations. There essentially would be no incremental increase in annual use or potential cumulative impacts resulting from the transportation and use of hazardous materials under the Proposed Action. The major difference between the proposed project and previous mining at the site is that it would continue the transportation and use of these materials for a longer period of time, thereby increasing the overall amount that would be used and consumed.

Future underground mining at the Ruby Hill Mine has been identified as a reasonably foreseeable future action. Assuming that potential future underground mining would occur following the completion of active mining, but potentially during ongoing ore processing, the potential cumulative impacts would be similar to those described above relative to past and present actions. Potential cumulative impacts associated with underground mining would be further evaluated under a separate environmental analysis. Ongoing mineral exploration in the area mainly would result in the consumption of fuels and lubricants and would represent only a fraction of the consumption and use of that of an operating mine.

3.18.4 Mitigation and Monitoring

Due to the legal framework that regulates the transportation, storage, use, and disposal of hazardous materials, no monitoring or mitigation measures have been identified.

3.18.5 Residual Adverse Impacts

Residual adverse effects from the use of hazardous materials for the Proposed Action would depend on the substance, quantity, timing, location, and response involved in the event of an accidental spill or release. Operation in accordance with the facility's SPCC Plan and Emergency Response and Contingency Plan, and prompt cleanup of potential spills and releases, would minimize the potential of residual adverse effects due to accidental spills or releases of hazardous materials. Reagents such as sodium cyanide can be acutely toxic, but do not persist in the environment for long periods of time. Modern regulations that govern the transportation, storage, use, and disposal of hazardous materials have greatly reduced the potential for residual adverse effects due to hazardous materials.

3.19 Environmental Justice

On February 11, 1994, President Clinton issued EO 12898, "Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations." EO 12898 has the primary purpose of ensuring that federal agencies make achieving environmental justice part of their mission by identifying and addressing, as appropriate, disproportionately high and adverse human health or environmental effects of its programs, policies, and activities on minority and low-income communities. The EO also explicitly calls for the application of equal consideration of Native American groups. In an accompanying presidential memorandum, the President emphasized existing laws, including NEPA, that provide opportunities for federal agencies to address environmental hazards in minority and low-income communities. The memorandum particularly emphasizes the importance of NEPA's public participation process, directing each federal agency to provide opportunities for community input in the NEPA process.

In April of 1998, the USEPA released the document titled "Final Guidance for Incorporating Environmental Justice Concerns in USEPA's NEPA Compliance Analysis." The document defines the approaches by which the USEPA will ensure that disproportionately high and adverse human health or environmental effects on minority communities and low-income communities are identified and addressed.

As stated, EO 12898 requires identifying and addressing disproportionately high and adverse human health or environmental effects on minority populations and low-income populations. These requirements were addressed in preparing this SEIS by: 1) ensuring broad distribution of public information on the proposed expansion through public scoping meetings, one held on June 16, 2004, and another on June 17, 2004, in Battle Mountain and Eureka, Nevada, respectively (see Section 4.1, Public Participation and Scoping); and 2) conducting government-to-government consultation with Native American communities (see Section 3.16, Native American Traditional Values).

3.19.1 Minority Populations

Minorities include individuals who are members of the following population groups: American Indian or Alaskan Native; Asian or Pacific Islander; Black, not of Hispanic origin; or Hispanic. The environmental justice guidance states that "a minority population may be present if 1) the minority population of the affected area exceeds 50 percent, or 2) the minority population percentage of the affected area is 'meaningful greater' than the minority population percentage in the general population or other 'appropriate unit of geographic analysis' (USEPA 1998)." The affected area for this SEIS analysis includes the U.S. Census Bureau subdivision of Eureka County (southern portion of the county), which includes the proposed expansion area and the town of Eureka. For comparison, the guidance suggests presenting data for the next larger geographic area or political jurisdiction to provide a context for population characteristics. The next larger geographic area is Eureka County.

Table 3.19-1 summarizes the ethnic composition of the affected area and of Eureka County. Baseline data presented in the table were obtained from the 2000 U.S. Census. According to the census data, the affected area is predominately White (89.8 percent) with the largest minority populations being American Indian or Alaskan Native (1.4 percent), Asian (1.0 percent), and Black (0.4 percent). Eureka County is primarily White (89.5 percent), with the largest minority populations being Asian (1.6 percent) and American Indian or Alaskan Native (1.3 percent).

Table 3.19-1
Ethnic Composition of the Affected Area and Eureka County

Location	Total Population	White		Black or African American		American Indian and Alaska Native		Asian		Native Hawaiian and Pacific Islander		Some Other Race[1]		Hispanic or Latino (of any race)	
		Number	Percent of Total	Number	Percent of Total	Number	Percent of Total	Number	Percent of Total	Number	Percent of Total	Number	Percent of Total	Number	Percent of Total
Eureka CCD[2]	1,103	991	89.8	4	0.4	15	1.4	11	1.0	0	0.0	54	4.9	110	10.0
Eureka County	1,651	1,478	89.5	4	0.0	21	1.3	26	1.6	1	0.0	66	4.0	158	9.6

[1] In combination with one or more of the other races listed.
[2] Census County Division.

Source: U.S. Census Bureau, Census 2000 Summary File 1(SF 1) 100-Percent Data.

As indicated by the data, none of the minority populations living in the affected area exceed 50 percent, and none of the minority populations are “meaningfully greater” than the minority populations in the next larger geographic area, in this case Eureka County. Therefore, for the purposes of screening for environmental justice concerns, a minority population, as defined in the USEPA’s guidance, does not exist within the affected area.

The guidance states that another factor to consider in assessing the presence of a minority population is that “a minority group comprising a relatively small percentage of the total population surrounding a project area may experience a disproportionately high and adverse effect resulting from the group’s use of, or dependence on potentially affected natural resources…” The construction and operation of the proposed expansion would not impact natural resources in a way that would result in such effects to individual groups in the area.

3.19.2 Low-income Populations

The environmental justice guidance recommends that low-income populations be identified using the annual statistical poverty thresholds from the Bureau of the Census’ Current Population Reports, Series P-60 on Income and Poverty. The guidance identifies a low-income population as a community comprised of “a group of individuals living in geographic proximity to one another, or a set of individuals (such as migrant workers or Native Americans), where either type of group experiences common conditions of environmental exposure or effect.” For purposes of this SEIS analysis, the “community” to be analyzed comprises individuals living within the affected area.

According to the 2000 census data, the average poverty threshold for a family of four persons was $16,895 in 1999 (**Table 3.19-2**). The median household income for populations living in the affected area was $43,594 and the per capita income was $18,029. The 1999 median household income for the affected area indicates a general level of income that was significantly above the poverty threshold. Approximately 2.5 percent of the population in the affected area were living below the poverty threshold.

Table 3.19-2
1999 Income Level of the Affected Area Based on a Sample

Location	Median Household Income	Per Capita Income	Poverty Threshold[1]	Percentage of Population Below Poverty Threshold
Eureka CCD[2]	$43,594	$18,029	$16,895	2.5 percent

[1] The average poverty threshold for a family of four persons in 1999. The poverty threshold is not adjusted for regional, state, or local variations in the cost of living.
[2] Census County Division – The U.S. Census Bureau subdivision of Eureka County, which encompasses the southern portion of the county.

Source: U.S. Census Bureau, Census 2000, Table DP-3, Profile of Selected Economic Characteristics, 2000.

Table 3.19-3 indicates that of the four ethnic populations living in the affected area, the incidence of poverty tended to be higher for the American Indian or Alaskan Native population. The American Indian or Alaskan Native population also had the lowest per capita income of the affected area. The data indicate that American Indian or Alaskan Natives are a low-income population group, as defined in the USEPA’s guidance (USEPA 1998), for the purposes of screening for environmental justice concerns.

Table 3.19-3
1999 Income Levels by Race in the Affected Area Based on a Sample

Location	Median Household Income				
	White	Black or African American	American Indian or Alaskan Native	Asian	Native Hawaiian or Pacific Islander
Eureka CCD[1]	$46,389	NA[2]	$7,500	$26,875	NA
	Per Capita Income				
	$18,985	NA	$7,642	$26,450	NA

[1] Eureka County Division
[2] No income data was available for the Black or African American and Native Hawaiian or Pacific Islander populations; there are no Native Hawaiian or Pacific Islanders in the affected area and the Black or African American population only makes up 0.4 percent of the affected area.

Source: U.S. Census Bureau, Census 2000 Summary File 3 (SF 3) – Sample Data.

3.19.3 Environmental Consequences

The impact analysis was based on the methods presented in the USEPA's *Final Guidance for Incorporating Environmental Justice Concerns in EPA's NEPA Compliance Analyses* (USEPA 1998). The guidance suggests a screening process to identify environmental justice concerns. This two-step process defines the significance criteria for this issue; if either criterion is unmet, there is little likelihood of environmental justice effects occurring. The two-step process is as follows:

1. Does the potentially affected community include minority and/or low-income populations?

2. Are the environmental impacts likely to fall disproportionately on minority and/or low-income members of the community and/or tribal resource?

If the two-step process discussed under *Study Methods* indicates that there exists a potential for environmental justice effects to occur, the following analyses are conducted to consider the following:

- Whether there exists a potential for disproportionate risk of high and adverse human health or environmental effects;

- Whether communities have been sufficiently involved in the decision-making process; and

- Whether communities currently suffer, or have historically suffered, from environmental and health risks and hazards.

The socioeconomic characteristics of the affected area and Eureka County are first analyzed for the presence of minority and/or low-income populations. Second, if minority and/or low-income populations are identified based on the USEPA's Environmental Justice Guidelines (USEPA 1998), the project is evaluated for potential effects that may be expected to disproportionally impact any such populations. If the two-step process above indicates that a potential for environmental justice effects exists, additional analyses under the significance criteria are then applied to determine if the adverse effects would be considered significant impacts if the proposed mine expansion were implemented.

3.19.3.1 Proposed Action

Initial analysis concluded that the potential effects of the Proposed Action would not be expected to disproportionately affect any particular population. The area north, west, and south of the proposed mine expansion is sparsely populated, with the nearest residence located approximately 1.5 miles to the northwest. The nearest residential area is located in the town of Eureka, approximately 0.7 mile southeast of the existing Ruby Hill Mine area. Eureka does not have an unusually high minority or low-income population, but does have a slightly greater proportion of Whites compared to Eureka County (see **Table 3.19-1**). Environmental effects that may occur at a greater distance, such as auditory resources or air impacts, would affect the area's population equally, without regard to nationality or income level.

However, a second provision of the criteria requires consideration of "impacts that may affect a cultural, historical, or protected resource of value to an Indian tribe or a minority population, even when the population is not concentrated in the vicinity." According to Section 3.16, Native American Traditional Values, no traditional cultural properties have been identified within the proposed mine expansion area that might be impacted by the Proposed Action. Therefore, there are no impacts associated with the Proposed Action on places of traditional Native American value.

On the basis of the second part of the criteria, the Proposed Action would not result in a disproportionate effect on a minority population. Since there is no disproportionate effect on an identified minority population as a result of the Proposed Action, no further environmental justice analyses are required.

3.19.3.2 No Action Alternative

Under the No Action Alternative, environmental justice effects would be the same as the Proposed Action.

3.19.4 Cumulative Impacts

There would be no cumulative impacts associated with the Proposed Action.

3.19.5 Mitigation and Monitoring

No mitigation or monitoring is recommended for environmental justice.

3.19.6 Residual Adverse Impacts

There would be no residual adverse environmental justice impacts associated with the Proposed Action.

3.20 Relationship Between Short-term Uses of the Human Environment and the Maintenance and Enhancement of Long-term Productivity

As described in the introduction to Chapter 3.0, short-term is defined as the 7-year operational life of the project and the 2-year reclamation period; long-term is defined as the future following reclamation (i.e., beyond 9 years). This section identifies the tradeoffs between the short-term impacts to environmental resources during operation and reclamation versus the long-term impacts to resource productivity that would extend beyond the end of reclamation.

The short-term use of resources during the construction, operation, and reclamation of the mine expansion would result in beneficial impacts in the form of additional local employment and the generation of revenue.

The proposed project would result in various short-term adverse impacts, such as the temporary loss of soil and vegetation productivity and the associated loss of herbaceous habitat, possible wildlife avoidance, a temporary reduction in the livestock grazing area and an associated loss of animal unit months, a temporary reduction in dispersed recreation opportunities, temporary increases in fugitive dust, social and economic impacts to the local infrastructure, potential vibration effects, and increased noise levels. These impacts are expected to end upon completion of operations and would be minimized through implementation of applicant-committed environmental protection measures.

The short-term adverse visual impacts would last a few years beyond mine closure and gradually would be reduced as vegetation becomes more established. The scale and extent of the waste rock expansion facilities would continue to alter the local landscape and views in the long term.

Impacts to long-term productivity (i.e., following project reclamation) primarily would depend on the effectiveness of the proposed reclamation of the disturbance areas. Successful reclamation would provide for post-mining wildlife and livestock grazing by establishing self-sustaining plant communities. Revegetation also is expected to stabilize disturbed surfaces and control erosion.

There would be long-term losses in soil and vegetation productivity and associated terrestrial wildlife shrub and woodland habitat, losses in woodland product productivity, a reduction in livestock grazing areas and an associated loss of 3 animal unit months, and a loss of 25 acres of public lands currently suitable for disposal as a result of the development of the pit expansion that would not be reclaimed. Based on the projected quality of the post-reclamation pit lake, a long-term gain in aquatic habitat on private land may occur.

3.21 Irreversible and Irretrievable Commitment of Resources

The Proposed Action could result in the irreversible commitment of resources (e.g., the loss of future options for resource development or management, especially of nonrenewable resources such as minerals or cultural resources) or the irretrievable commitment of resources (e.g., the lost production or use of renewable natural resources during the life of the operations). Irreversible and irretrievable impacts of the Proposed Action are summarized for each resource in **Table 3.21-1**.

Table 3.21-1
Irreversible and Irretrievable Commitment of Resources by the Proposed Action

Resource	Irreversible Impacts	Irretrievable Impacts	Explanation
Air Quality	No	No	Project emissions would not exceed federal or state AAQS. Air quality would return to existing conditions after completion of the project.
Geology and Minerals	Yes	Yes	Approximately 18 million tons of ore would be mined during operations. This would result in the irreversible and irretrievable commitment of this resource. No irreversible or irretrievable geologic hazard impacts are anticipated.
Paleontology	No	No	No disturbance to scientifically significant paleontological resources is anticipated.
Water Quality and Quantity	No	Yes	Groundwater levels affected by mine dewatering and injection/infiltration operations are predicted to substantially recover in the long term. Up to approximately 1,590 acre feet per year of groundwater would be pumped during dewatering operations. Approximately 665 acre feet per year of the dewatering water would be consumed for operational use, resulting in an irretrievable commitment of this resource. The remainder of the pumped groundwater would be returned to the alluvial aquifer via injection/infiltration and, therefore, would be available for future use.
Soils	Yes	Yes	Suitable growth media would be salvaged from the mine expansion area for use in reclamation. There would be a loss of soil productivity during operations on approximately 644 acres, resulting in an irretrievable commitment of this resource. There would be an irreversible commitment of the resource on approximately 100 acres associated with the mine expansion area, which would not be reclaimed.
Vegetation Resources	Yes	Yes	There would be an irretrievable commitment of vegetation resources on approximately 644 acres during operations; vegetation subsequently would be reestablished. Approximately 100 acres of vegetation would be irreversibly lost as a result of development of the pit expansion. No irreversible or irretrievable special status plant species impacts are anticipated.
Range Resources	Yes	Yes	There would be an irreversible loss of 3 animal unit months associated with the pit expansion and an irretrievable loss of 34 animal unit months during the life of the project.
Woodland Products	Yes	Yes	There would be an irretrievable commitment of woodland products on approximately 451 acres of mine-related disturbance, of which 166 acres would occur on BLM-administered land; piñon and juniper subsequently would be allowed to naturally reestablish, resulting in long-term recovery. Approximately 92 acres of woodland products would be irreversibly lost as a result of development of the pit expansion, of which approximately 25 acres would occur on BLM-administered land.
Invasive and Non-native Species	No	No	No irreversible or irretrievable impacts associated with invasive or non-native species are anticipated.

Table 3.21-1 (Continued)

Resource	Irreversible Impacts	Irretrievable Impacts	Explanation
Wildlife Resources	Yes	Yes	Approximately 100 acres of habitat would be irreversibly lost as a result of development of the pit expansion; however, development of the post-mining pit lake could result in additional aquatic habitat availability. Approximately 644 acres of habitat would be irretrievably lost until vegetation has reestablished following reclamation. Impacts to special status wildlife species would parallel those for general wildlife.
Land Use Authorizations and Access	Yes	Yes	There would be no irreversible or irretrievable impacts to access; public access patterns would be maintained. Approximately 112 acres of public lands suitable for disposal would not be available during operations and would represent an irretrievable commitment of resources. An irreversible commitment of resources would occur on approximately 25 acres of public land associated with the pit expansion that no longer would be suitable for disposal.
Recreation and Wilderness	Yes	Yes	There would be an irretrievable loss of public land available for dispersed recreational opportunities during operations and reclamation; an irreversible loss would occur on approximately 25 acres of public land associated with the pit expansion.
Visual Resources	Yes	No	Impacts to visual resources would be reduced through successful reclamation procedures and implementation of the environmental protection measures, but permanent changes would result.
Noise and Blasting Vibrations	No	No	Noise and blasting are not considered irreversible, because they would cease following the completion of mine operations.
Cultural Resources	No	No	No disturbance to known cultural sites is anticipated.
Native American Traditional Values	No	No	No impacts to native traditional values have been identified as a result of the Proposed Action.
Social and Economic Values	No	Yes	There would be increased local productivity including jobs for construction and operations workers during the life of the project. Eureka and Eureka County public revenues also would benefit.
Hazardous Materials and Solid Waste	No	No	No irreversible or irretrievable commitment of resources or impact is anticipated. However, if a spill were to affect a sensitive resource, an irretrievable impact could occur pending the recovery of the resource.
Environmental Justice	No	No	No environmental justice issues have been identified as a result of the Proposed Action.

4.0 PUBLIC COORDINATION

4.1 Public Participation and Scoping

The public participation program for the Ruby Hill Mine Expansion – East Archimedes Project SEIS includes the following components.

Two public scoping meetings were held for the SEIS, one on June 16 and another on June 17, 2004, in Battle Mountain and Eureka, Nevada, respectively.

The scoping comments were summarized and included in the SEIS Preparation Plan. The following are the key scoping issues identified for the proposed expansion project.

- Potential air quality impacts from fugitive dust and mercury
- Potential impacts to groundwater and surface water quantity from pit dewatering
- Potential short-term and long-term impacts to groundwater and surface water quality
- Post-closure pit water quality
- Potential for pit lake aquatic community development and associated potential impacts for fisheries and vegetation
- Potential impacts to native vegetation and soil productivity as a result of project development and reclamation
- Potential impacts to wildlife and wildlife habitat from land clearing, mine operations, and a potential hazardous materials spill
- The need for an ecological risk assessment
- Potential short-term and long-term livestock grazing impacts
- Potential noise impacts from mine operations
- Potential visual impacts associated with mine expansion
- Potential vibration-related impacts to historic buildings as a result of blasting
- Potential transportation impacts associated with off site transport of ore and mine access traffic safety

- Potential social and economic impacts
- Potential cumulative impacts

4.2 List of Contacts

While preparing the SEIS for the proposed Ruby Hill Mine Expansion – East Archimedes Project, the BLM communicated with, and received input from, various federal, state, and local agencies and private organizations. The following sections list these contacts.

4.2.1 Federal Agencies

Natural Resource Conservation Service
U.S. Fish and Wildlife Service

4.2.2 State Agencies

Nevada Bureau of Air Pollution Control
Nevada Division of Environmental Protection
Nevada Department of Wildlife
Nevada Natural Heritage Program
State Historic Preservation Office

4.2.3 Local Agencies

Eureka County Commissioners
Eureka County Economic Development
Eureka County NEPA Committee
Eureka County Planning Commission
Eureka County Public Works
Eureka County School District

4.2.4 Tribal Organizations

Battle Mountain Band
Duckwater Shoshone
Elko Band
Ely Shoshone
South Fork Band
Te-Moak Tribe
Wells Band
Yomba Shoshone

4.3 List of Agencies, Organizations, and Persons to Whom Copies of this Statement are Sent

4.3.1 Federal Agencies

Bolling Air Force Base
Bureau of Land Management, Carson City Field Office
Bureau of Land Management, Elko Field Office
Bureau of Land Management, Ely Field Office
Bureau of Land Management, Las Vegas Field Office
Bureau of Land Management, Tonopah Field Station
Bureau of Land Management, Winnemucca Field Office
National Training Center
U.S. Air Force – Office of Deputy A/S
Office of Environmental Compliance (EH-23)
Programs Administrator, A I L A
U.S. Army Corp of Engineers, Reno, Nevada
U.S. Army Corps of Engineers, Sacramento, California
U.S. Bureau of Reclamation, Denver, Colorado
U.S. Department of Energy – Environmental Safety, Occupation Health
U.S. Department of the Interior OEPC
U.S. Department of the Interior – Minerals Management Services
U.S. Department of the Interior – National Park Service
U.S. Environmental Protection Agency, Environmental Review Coordinator
U.S. Environmental Protection Agency, Washington, DC
U.S. Environmental Protection Agency, San Francisco, California
U.S. Fish and Wildlife Service, Washington, DC
U.S. Fish and Wildlife Service, Reno, Nevada
U.S. Forest Service, Austin Ranger District
U.S. Geological Survey

4.3.2 State Agencies

Nevada Clearinghouse/SPOC, Dept of Administration
Nevada Division of Environmental Protection – Bureau of Mining Regulation and Reclamation
Nevada Department of Agriculture
Nevada Department of Transportation
Nevada Department of Wildlife, Tonopah Field Office
Nevada Department of Wildlife, Elko, Nevada
Nevada Department of Wildlife, Eureka, Nevada
Nevada Department of Wildlife, Las Vegas, Nevada
Nevada Department of Wildlife, Reno, Nevada
Nevada Division of Minerals
Nevada Outdoor Recreation Association
State Historic Preservation Office

4.3.3 Elected Officials

Honorable Shelley Berkley
Jim Gibbons, Congressman
John Ensign, Senator
Harry Reid, Senator
Kenneth Guinn, Governor
Wendell P Williams, Assemblyman
Joseph Neal, State Senator
Dean A. Rhoads, State Senator
Pete Goicoechea, Assemblyman

4.3.4 County and Local Agencies

Board of Eureka County Commissioners
Board of Humboldt County Commissioners
Elko County Commissioners
Eureka County NEPA Committee
Eureka County Public Works
Eureka County School District
Eureka County Natural Resources Department
Humboldt River Basin Water Authority
Lander County Commissioners, Battle Mountain and Austin, Nevada
Lander County District Attorney
Lander County Public Land Use Advisory Planning Committee
Lovelock Water District
Nye County Planning Department
Nye County Commissioners, Tonopah, Nevada
Pershing Water Conservation District
Winnemucca City Council

4.3.5 Tribal Organizations

Battle Mountain Band Te-Moak Tribe of the Western Shoshone
Duckwater Shoshone Tribe
Elko Band Te-Moak Tribe of the Western Shoshone
Ely Shoshone Tribe
Shoshone-Paiute Tribes of Duck Valley
South Fork Band Te-Moak Tribe of the Western Shoshone
Te-Moak Tribe of the Western Shoshone
Wells Band Te-Moak Tribe of the Western Shoshone
Yomba Shoshone Tribe

4.3.6 Newspapers and Libraries

Battle Mountain Bugle
Elko Daily Free Press

4.3.7 Other Organizations

American Horse Protection Association
Austin Advisory Airport Board
Earthworks
Enviroscientists, Inc.
Friends of the Clearwater
Global Response Network
Great Basin Mine Watch
Western Shoshone Defense Project
Western Watersheds Project
Wild Horse Commission

4.3.8 Industry/Business

Agri-Beef
Badger/Chiara Ranches
Barrick Gold Corporation
Century Gold LLC
Dinwiddie's Machine Shop
Eureka Livestock Co.
Eureka Opera House
Filippini Ranching Co.
Fish Creek Ranch LLC
Homestake Mining Company of California
JBR Environmental Consultants
Julian Tomera Ranches, Inc.
Mackay School of Mines
National Wild Horse & Burro Center
National Wildlife Federation
Newmont Mining Corporation
Palisade Ranch
Pastorino Rentals
Sheep Creek Ranch
Silver Creek Ranch
Vista Gold Corp.

4.3.9 Individuals

Jerry Anderson
Bryant Barnson
Jim Baumann
Mark Bennett
Jack Cardinalli
John C. Carpenter
Ken Conley
Kenneth D. Cunningham
Bob & Margaret Dyer
John Etchegaray
LeRoy Etchegaray
John Filippini
Leonard Fiorenzi
Art Gale
Sandy Green
Charlie Harper
James P. Ithurralde
Joel Lenz
Shawn Mariluch
Robert D. McCracken
Faye Morrison
Tom Myers
Clayton E. Nicholes
David A. Pastorino
Roy & Mary Risi
Wayne Robinson
Kim & Kevin Russell
Ray Salisbury
Carl Slagowski
Jane Tollison

4.4 Public Comments and Responses

During the 45-day public comment period on the Ruby Hill Mine Expansion – East Archimedes Project Draft SEIS, the BLM received 18 written comments. The comment letters and forms are reproduced in their entirety in Appendix A of this Final SEIS. Each comment is identified by a bracket and a letter and comment number (e.g., comment 2-3 refers to the third comment in letter 2). The response to each comment accompanies the letter and is identified by the reference number of the respective comment (e.g., response to comment 2-3).

Two public meetings were held for the Draft SEIS, one meeting in Battle Mountain on April 20 and another meeting in Eureka on April 21. A total of 42 people signed the sign-in sheets at the public meetings.

Table 4-1 lists each of the comment letters by respondent and the assigned letter number. Each letter has been reviewed in its entirety and considered by the BLM in determining the BLM-preferred Alternative (Section 2.8) for the proposed project.

Table 4-1
Public Comment Letters

Letter Number	Respondent
Federal Agencies	
1	U.S. Fish and Wildlife Service
2	U.S. Environmental Protection Agency
3	U.S. Geological Survey
Nevada State Agencies	
4	Department of Administration, Nevada State Clearinghouse
5	Nevada Department of Wildlife, Rory E. Lamp
Local Agencies	
6	Eureka County Department of Natural Resources
7	Elko County Board of Commissioners
Organizations and Individuals	
8	Great Basin Mine Watch
9	Leonard Fiorenzi
10	Tony Carone
11	Melodie Nicholes
12	Bryan Mahoney
13	Bryant Barnson
14	Clayton Nicholes
15	Dennis Gordon
16	Gary Frost
17	Karl Marlowe
18	Melinda Daubenschmidt

5.0 LIST OF PREPARERS AND REVIEWERS

Bureau of Land Management SEIS Team		
Responsibility	**Name**	**BLM Office Locations**
Field Manager	Gerald Smith	Battle Mountain Field Office
Assistant Field Manager	Gail Givens	Battle Mountain Field Office
NEPA Coordinator, Environmental Justice	Pam Jarnecke	Battle Mountain Field Office
Minerals, 3809 Lead, Reclamation	Caleb Hiner	Battle Mountain Field Office
Lands and Rights-of-Way	Charles Lahr	Battle Mountain Field Office
Fire Management	Dave Davis	Battle Mountain Field Office
Air Quality	Lisa Christianson	Las Vegas Field Office
Water Quality and Quantity	Jon Sherve	Battle Mountain Field Office
	Tom Olson	Nevada State Office
Cultural Heritage, Paleontology	Janice George	Battle Mountain Field Office
Native American Coordination	Gerald Dixon	Elko and Battle Mountain Field Offices
Forestry, Soils	Joe Ratliff	Battle Mountain Field Office
Range Resources, Vegetation	Jerrie Bertola	Battle Mountain Field Office
Invasive, Non-native Species	Richard Kurtz	Battle Mountain Field Office
Migratory Birds, Special Status Species	Mike Stamm	Battle Mountain Field Office
Riparian and Wetlands, Wildlife	Duane Crimmins	Battle Mountain Field Office
Hazardous Materials and Solid Waste	Stephen Drummond	Battle Mountain Field Office
Recreation, Wilderness, Wilderness Study Areas, and Visual Resources	Robert Perrin	Battle Mountain Field Office
Cooperating Agency SEIS Team		
Agency		**Name**
Nevada Department of Wildlife		Rory Lamp
Eureka County NEPA Committee		 John Brown Ron Carrion Jim Gallagher Bill Hicks Jim Ithurralde Andy Marshall Ken Olsen Marty Plaskett Christine Smith David Stine
ENSR SEIS Team (Third-party Consultant)		
Responsibility	**Name**	**Degree(s) and Experience**
Project Manager, NEPA Compliance	Valerie Randall ENSR	BA Urban Studies 26 years experience
Assistant Project Manager and NEPA Document Coordinator	Dolora Koontz ENSR	BA Biology 15 years experience
Water Quality and Quantity	Robert Berry ENSR	PhD Geology/Geochemistry Prof. Degree – Hydrology BS Geology 25 years experience
Geology and Minerals, Hazardous Materials and Solid Waste	William Berg ENSR	MS Geology BS Geology 23 years experience

ENSR SEIS Team (Third-party Consultant) (Continued)		
Responsibility	**Name**	**Degree(s) and Experience**
Air Quality	Vince Scheetz ENSR	MS Systems Management BS Mathematics 34 years experience
Soils, Vegetation, Special Status Plant Species, Range Resources, Invasive/Non-native Species, Woodland Products, and Reclamation	Jon Alstad ENSR	MS Range Science BS Animal Science 19 years experience
	Shea Ryan ENSR	BS Wildlife Biology 1 year experience
Wildlife and Special Status Species	Charles Johnson ENSR	MS Biology BS Wildlife Biology 15 years experience
	Shea Ryan ENSR	BS Wildlife Biology 1 year experience
Fisheries	Rollin Daggett ENSR	MS Aquatic Biology BS Zoology 28 years experience
Cultural Heritage, Native American Traditional Values, Paleontology, and Environmental Justice	Kim Munson ENSR	MA Anthropology BA Anthropology 10 years experience
Land Use Authorizations and Access, Recreation, and Wilderness	Todd White ENSR	MCP Community Planning MEn Environmental Science AM Anthropology BA Geology 11 years experience
Visual Resources and Graphics	Merlyn Paulson ENSR	MLA II Landscape Architecture and Geographic Information Systems BLA Landscape Architecture and Environmental Planning 30 years experience
Noise and Blasting Vibrations	Joe Sanders ENSR	MS Public and Occupational Health BS Physics 31 years experience
Social and Economic Values	Ron Dutton HSGA	MS Economics BS Economics 27 years experience
Invasive/Non-native Species Survey, Weed Prevention Plan, Weed Control and Monitoring Plan, and Pesticide Use Proposal	Catherine Davis JBR	MS Hydrology BS Range and Wildlands Science 12 years experience
Document Production and Editing	Sue Coughenour ENSR	2 years General Education 18 years experience
Graphics Preparation	Scott MacKinnon ENSR	BS Physical Geography 1 year experience

Homestake Reviewers	
Name	**Title**
Matt Zietlow	Environmental Manager, Ruby Hill Mine
Steve Brower	General Manager, Ruby Hill Mine
Dave Deisley	Associate Corporate Council, Barrick Gold Corporation

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7.0 GLOSSARY

Acre-feet	The volume of water required to cover 1 acre to a depth of 1 foot; equivalent to a volume of 43,560 cubic feet.
Allotment	A unit of land suitable and available for livestock grazing that is managed as one grazing unit.
Alluvial	Pertaining to material or processes associated with transportation or deposition of soil and rock by flowing water (e.g., streams and rivers).
Alluvium	Unconsolidated or poorly consolidated gravel, sands, and clays deposited by streams and rivers on riverbeds, floodplains, and alluvial fans.
Ambient	The environment as it exists at the point of measurement and against which changes or impacts are measured.
Ambient Noise	Total, all-encompassing noise associated with a given environment and time.
Animal Unit Months	Grazing of a cow/calf, sheep/lamb, or other animal pair for 1 month.
Aquiclude	Impermeable layer that prevents vertical groundwater migration.
Aquifer	A body of rock that is sufficiently permeable to conduct groundwater and to yield economically significant quantities of water to wells and springs.
Artesian	Refers to groundwater under sufficient hydrostatic head to rise above the aquifer in which it is contained.
Background Noise	Noise from all sources other than that from a particular source of interest (e.g., other than mining noise if mining noise were being investigated).
Barren Solution	In a metallurgical process, the solution left after the mineral value has been removed.
Bedrock	Any solid rock exposed at the surface or overlain by unconsolidated material.
BLM Sensitive Species	Previous Category 2 (C2) candidate species.
Code of Federal Regulations	The compilation of federal regulations adopted by federal agencies through a rule-making process.

Cone of Depression	The depression of groundwater levels around a pumping well caused by the withdrawal of water.
Confining Bed	A layer of rock having very low hydraulic conductivity that hampers the movement of water into and out of an aquifer.
Cretaceous	The span of time between 144 and 66 million years ago.
Critical Habitat	Habitat that is present in minimum amounts and is the determining factor in the potential for population maintenance and growth.
Cumulative Effects	The combined environmental impacts that accrue over time and space from a series of similar or related individual actions, contaminants, or projects. Although each action may seem to have a negligible impact, the combined effect can be significant. Included are activities of the past, present, and reasonably foreseeable future; synonymous with cumulative impacts.
dB	Decibel. A unit used in expressing ratios of electric or acoustic power; the relative loudness of sound.
dBA	A-weighting. The most commonly used frequency weighting measure; simulates human sound perception and correlates well with human perception of the annoying aspects of noise.
Direct Impacts	Impacts that are caused by the action and occur at the same time and place (40 Code of Federal Regulations 1508.7); synonymous with direct effects.
Discharge	The volume of water flowing past a point per unit time, commonly expressed as cubic feet per second, gallons per minute, or million gallons per day.
Disturbed Area	An area where natural vegetation and soils have been removed.
Dolomite	A mineral, calcium magnesium carbonate ($CaMg[CO_3]_2$), or a rock composed largely of dolomite.
Drainage	The natural channel through which water flows some time of the year; natural and artificial means for affecting discharge of water as by a system of surface and subsurface passages.
Drawdown	The lowering of the water level in a well as a result of withdrawal; the reduction in groundwater level at a point caused by the withdrawal of water from an aquifer.

Endangered Species	Any species in danger of extinction throughout all or a significant portion of its range. Plant or animal species identified by the Secretary of the Interior as endangered in accordance with the 1973 Endangered Species Act.
Ephemeral Stream	A stream or portion of a stream that flows briefly in direct response to precipitation in the immediate vicinity and whose channel is at all times above the water table.
Erosion	The wearing away of soil and rock by weathering, mass wasting, and the action of streams, glaciers, waves, wind, and groundwater.
Evapotranspiration	The portion of precipitation returned to the air through evaporation and plant transpiration.
Exploration	The search for economic deposits of minerals, ore, and other materials through practices of geology, geochemistry, geophysics, drilling, and/or mapping.
Fault	A fracture in rock units along which there has been displacement.
Flocculant	A reagent added to water to aggregate minute suspended particles so that they may precipitate out of suspension.
Floodplain	That portion of a river valley, adjacent to the channel, that is built of sediments deposited during the present regimen of the stream and that is covered with water when the river overflows its banks at flood stages.
Fugitive Dust	Dust particles suspended randomly in the air from various sources including road travel, excavation, and rock loading operations.
Geochemistry	The study of the distribution and amounts of the chemical elements in minerals, ores, rocks, soils, water, and the atmosphere, and their circulation in nature on the basis of the properties of their atoms and ions.
Geotechnical	A branch of engineering concerned with the engineering design aspects of slope stability, settlement, earth pressures, bearing capacity, seepage control, and erosion.
Groundwater Recovery	An increase in groundwater levels such that the groundwater elevations rise above initial baseline groundwater elevations. Used to refer to an increase in water levels following drawdown.

Groundwater Table	The surface between the zone of saturation and the zone of aeration; that surface of a body of unconfined groundwater at which the pressure is equal to that of the atmosphere.
Habitat	A specific set of physical conditions that surround a single species, a group of species, or a large community. In wildlife management, the major components of habitat are considered to be food, water, cover, and living space.
Heap Leaching	The process of recovering gold and other metals from low-grade ores by leaching ore that has been mined and placed on a specially prepared pad. A chemical solution is applied through low volume emitters, and the metal-bearing leachate solution percolates and is collected.
Hydraulic Conductivity	The capacity of a rock to transmit water. It is expressed as the volume of water at the existing kinematic viscosity that will move in unit time under a unit hydraulic gradient through a unit area measured at right angles to the direction of flow.
Hydrostratigraphic Unit	Grouping of stratified, mainly sedimentary rocks that have similar hydrologic properties.
Impact	A modification in the status of the environment brought about by the proposed action or an alternative.
Indirect Impacts	Impacts that are caused by the action and are later in time or farther removed in distance, but are still reasonably foreseeable (40 Code of Federal Regulations 1508.8); synonymous with indirect effects.
Infiltration	The movement of water or some other liquid into the soil or rock through pores or other openings.
Irretrievable	Applies primarily to the lost production of renewable natural resources during the life of the project.
Irreversible	Applies primarily to the use of nonrenewable resources, such as minerals, cultural resources, wetlands, or to those factors that are renewable only over long time spans, such as soil productivity. Irreversible also includes loss of future options.
Jurisdictional Wetland	A wetland area identified and delineated by specific technical criteria, field indicators, and other information for purposes of public agency jurisdiction. The public agencies that administer jurisdictional wetlands are the U.S. Army Corps of Engineers, the U.S. Environmental Protection Agency, the U.S. Fish and Wildlife Service, and the U.S. Natural Resources Conservation Service.

Key Observation Point	An observer position on a travel route used to determine visible area.
L_d	Day average sound level. L_{eq} for the daytime period from 7:00 a.m. to 10:00 p.m.
L_{dn}	Day-night average sound level. L_{eq} for a 24-hour, midnight to midnight period with 10 dBA added to the sound levels from 10:00 p.m. to 7:00 a.m.
Leachate	A solution obtained by leaching as in downward percolation of water through soil or waste.
L_{eq}	Equivalent continuous sound level. Level of steady state sound that, in a specific time period, has an equal amount of sound energy as the actual time-varying sound.
L_{max}	Maximum sound level. The greatest sound level measured on a sound level meter during a designated time interval or event, using “fast” time averaging on the meter.
L_n	Night average sound level. L_{eq} for the nighttime period from midnight to 7:00 a.m. and from 10:00 p.m. to midnight.
Mineralization	The process by which a valuable mineral or minerals are introduced into a rock.
Mitigate, Mitigation	To cause to become less severe or harmful; actions to avoid, minimize, rectify, reduce or eliminate, and compensate for impacts to environmental resources.
Monitor	To systematically and repeatedly watch, observe, or measure environmental conditions in order to track changes.
National Environmental Policy Act	The National Environmental Policy Act (NEPA) of 1969; the national Policy charter for protecting the environment. NEPA establishes policy, sets goals, and provides means for carrying out the policy. Regulations from 40 Code of Federal Regulations 1500-1508 implement the act.
National Pollutant Discharge	A part of the Clean Water Act that requires point source dischargers to obtain permits. These permits are referred to as NPDES permits and are administered by the U.S. Environmental Protection Agency.
National Register of Historic Places	A list, maintained by the National Park Service, of areas that have been designated as being of historical significance.

Native Species	Plants that originated in the area in which they are found (i.e., they naturally occur in that area).
Nevada Administrative Code	The text of the regulations implementing the laws passed by the Nevada legislature.
Nevada Revised Statutes	The text of laws passed by the Nevada legislature.
Ore	A deposit of rock from which a valuable mineral or minerals can be economically extracted.
Overburden	Material that must be removed to allow access to an orebody, particularly in a surface mining operation.
Paleozoic	The span of time between approximately 570 and 245 million years ago.
Particulate(s)	Minute, separate particles, such as dust or other air pollutants.
Perennial Stream	A stream or reach of a stream that flows throughout the year.
Physiographic Province	Region in which all parts have similar geologic structure and climate and whose landforms differ significantly from those of other regions.
Precambrian	The span of time older than 570 million years.
Pregnant Solution	Solution derived from the leaching process that contains dissolved metals.
Project Alternatives	Alternatives to the Proposed Action developed through the NEPA process.
Raptor	A bird of prey (e.g., eagle, hawk, falcon, and owl).
Recovery (Groundwater)	An increase in groundwater levels such that the groundwater elevations rise above initial baseline groundwater elevations. Refers to an increase in water levels following drawdown.
Reserves	Identified resources of mineral-bearing rock from which the mineral can be extracted profitably with existing technology and under present economic conditions.
Right-of-Way	Strip of land or corridor over which a power line, access road, or maintenance road would pass.
Riparian	Situated on or pertaining to the bank of a river, stream, or other body of water. Riparian is normally used to refer to plants of all types that grow along streams, rivers, or at spring and seep sites.

Run-of-Mine Ore	Ore that is taken from a mine or pit directly to a mill for processing.
Runoff	That part of precipitation that appears in surface streams; precipitation that is not retained on the site where it falls and is not absorbed by the soil.
Sediment	Material suspended in or settling to the bottom of a liquid. Sediment input comes from natural sources, such as soil erosion and rock weathering, construction activities, or anthropogenic sources, such as forest or agricultural practices.
Sediment Load	The amount of sediment (sand, silt, and fine particles) carried by a stream or river.
Seismicity	The likelihood of an area being subject to earthquakes; the phenomenon of earth movements.
Sensitive Receptors (Noise)	Activities or land uses that are more susceptible than others to noise interference.
Species	A group of individuals of common ancestry that closely resemble each other structurally and physiologically, and in nature interbreed producing fertile offspring.
Stratigraphy	Form, arrangement, geographic distribution, chronological succession, classification, and relationships of rock strata.
Subsidence	Sinking or downward settling of the earth’s surface.
Tertiary	The span of time between 65 and 10 million years ago.
Threatened Species	Any species of plant or animal that is likely to become endangered within the foreseeable future throughout all or a significant portion of its range.
Total Dissolved Solids	The total amount of dissolved material, organic or inorganic, contained in a sample of water.
Total Suspended Solids	The amount of undissolved particles suspended in a sample of water.
Transmissivity	The rate at which water of the prevailing kinematic viscosity is transmitted through a unit width of an aquifer under a unit hydraulic gradient; it equals the hydraulic conductivity multiplied by the aquifer thickness.

Visual Resource	The composite of basic terrain, geologic features, water features, vegetation patterns, and land use effects that typify a land unit and influence the visual appeal the unit may have for viewers.
Visual Resource Management Classes	A classification of landscapes according to the kinds of structures and changes that are acceptable to meet established visual goals (BLM).
Water Table	The level in the saturated zone at which the pressure is equal to the atmospheric pressure.
Waters of the United States	A jurisdictional term from Section 404 of the Clean Water Act referring to water bodies such as lakes, rivers, streams (including intermittent streams), mudflats, sandflats, wetlands, sloughs, prairie potholes, wet meadows, playa lakes, or natural ponds. The use, degradation, or destruction of these waters could affect interstate or foreign commerce.
Wetlands	Areas that are inundated by surface or groundwater with a frequency sufficient to support (and under normal circumstances do or would support) a prevalence of vegetation or aquatic life that requires saturated or seasonally saturated soil conditions for growth and reproduction.
Wind Rose	A graphical representation of wind direction and wind speed frequencies.

8.0 INDEX

APPENDIX A

DRAFT SEIS PUBLIC COMMENTS AND RESPONSES

Letter 1

United States Department of the Interior

FISH AND WILDLIFE SERVICE
1340 Financial Blvd., Suite 234
Reno, Nevada 89502
Ph: 775-861-6300 ~ Fax: 775-861-6301

TAKE PRIDE IN AMERICA

March 22, 2005
File No. FP BLM 4-4

Memorandum

To: Field Manager, Bureau of Land Management, Battle Mountain Field Office, Battle Mountain, Nevada (Attn: Caleb Hiner)

From: Field Supervisor, Fish and Wildlife Service, Nevada Fish and Wildlife Office, Reno, Nevada

Subject: Ruby Hill Mine Expansion – East Archimedes Project, Draft Supplemental Environmental Impact Statement

We have reviewed the Ruby Hill Mine Expansion – East Archimedes Project, Draft Supplemental Environmental Impact Statement (DSEIS). The Homestake Mining Company (Homestake) proposes to expand the Ruby Hill Project which is located within the historic Eureka Mining District in Eureka County. The proposed expansion would include an extension of the existing open pit, expansion of waste rock disposal areas, expansion of the heap leach pad, and construction of dewatering facilities. The proposed action would require surface disturbance of approximately 744 acres, which includes 190 acres of public land, and 544 acres of private land owned by Homestake. We have the following comments and recommendations on the DSEIS.

1-1 Executive Summary, pages ES-1 to ES-9: The Executive Summary should be modified in response to any significant changes made to the text in response to our comments and recommendations below. Two areas of major concern follow. In the subsections on Pit Lake Formation and Potential Impacts to Wildlife Associated with Pit Lake Water Quality, stock watering standards may not be protective of migratory birds; we recommend that these sections be modified (see our comments below).

1-2 2.3.3 Dewatering and Water Disposal, page 2-11: Additional information on the construction and management of the rapid infiltration basin would be useful in order to determine if an aquatic community could develop, which could become attractive to migratory birds. If the latter is the case, we would be interested in the long-term water quality in the basin and the potential for accumulation of metals and trace elements in biota, which could be consumed by migratory birds.

Responses to Letter 1

1-1 Text in the Executive Summary and Section 3.10.2.1 of the Final SEIS relative to potential wildlife impacts associated with pit lake water quality has been revised to include reference to U.S. Environmental Protection Agency (USEPA) criteria and Nevada standards for aquatic life.

1-2 As indicated in Section 2.3.3 of the SEIS, the rapid infiltration basins would be constructed in an existing borrow pit in material composed primarily of sand and gravel. Both basins would receive varying flows of dewatering water in excess of that used on the mine site, with basin water levels fluctuating regularly due to daily and seasonal variations in mine water use rates. The basins would be temporal in nature as they would be used only while the mine is conducting dewatering operations and thus would not hold water on a long-term basis. Because of the water level fluctuations, along with periodic complete drying out of the basins for cleaning and maintenance, aquatic communities are not expected to develop in the basins.

Letter 1 Continued

Caleb Hiner

File No. FP BLM 4-4

1-3 2.3.7.5 Refining, page 2-22: Mercury emissions in relation to the refining process should be mentioned here.

1-4 2.3.14.3 Emergency Response and Spill Contingency, page 2-30: The citation used in the fourth line appears to be in error. This citation in the References deals with pygmy rabbit habitat; WESTEC (1997c) may be the proper citation.

1-5 3.1.1.2 Air Quality, Mercury, page 3.1-7: In the third full paragraph on the page, fourth sentence, it should also be acknowledged that significant ecological risks may occur in addition to potential human risks. Significant ecological receptors involving mercury toxicity have been clearly demonstrated. Therefore, it would be appropriate to also delete the word "potential" in relation to risks. The source(s) of the data in the paragraph should be cited. It would also be helpful to discuss the high rate of biomagnification of mercury in the food chain here or elsewhere in the document.

1-6 3.1.2.1 Proposed Action, page 3.1-10: Mercury emissions from some mines in Nevada are significant. Therefore, it would be helpful to provide data on estimated mercury emissions from the Ruby Hill Mine, with information on the sources (e.g., smoke stack emissions) in the next to last paragraph of the section.

1-7 3.1.4 Mitigation and Monitoring, page 3.1.11: We recommend that mercury emissions from smoke stacks at the mine be monitored.

1-8 3.1.5 Residual Adverse Impacts, page 3.1-11: This section should include a discussion of the potential adverse effects of mercury emissions from all sources at the mine due to risks related to very high mercury biomagnification rates in food chains.

1-9 3.4.1.1 Surface Water, Surface Water Quality, page 3.4-3: In the first paragraph, line 6, the first NAC section number appears to be in error. In the second paragraph, it would be helpful to include a citation for the USGS data source. Aquatic life standards should be provided in the tables if they apply to the springs.

1-10 Table 3.4-1, page 3.4-5: Irrigation and Stock Water standards are missing for lead.

1-11 Table 3.4-2, page 3.4-6: The year of collection is incomplete for the Sheriff's office spring; the location should also be provided unless confidentiality issues are a concern. It would be helpful to plot the locations of the springs that are listed here on a figure. For clarity, the footnotes should indicate the type of standard that is cited. For example, these are not aquatic life standards. What does NEG mean for location SPLE #8 under the column for arsenic? How should zero values be interpreted?

Responses to Letter 1

1-3 Please see Section 3.1.2.1 of the Final SEIS relative to mercury emission sources and emissions at the mine. Information regarding mercury emissions as previously reported during operation of the existing Ruby Hill Mine has been added to Section 3.1.2.1 of the Final SEIS.

1-4 The correct citation is WESTEC 1997c. The citation has been corrected in the Final SEIS.

1-5 The Ruby Hill Mine is not a source of the most harmful forms of mercury, which are methyl-mercury compounds. The mine is a small source of particulate and elemental mercury, as stated in Section 3.1.2.1 of the Final SEIS. These forms of mercury would be emitted by the mine in small amounts unlikely to pose a health risk. They do not readily transform into harmful methyl-mercury compounds nor should there be a significant potential for bio-magnification in food chains.

1-6 Please see the response to comment 1-3.

1-7 Controls are in place on the carbon kiln and refinery to reduce mercury emissions. Throughput of the carbon kiln and the retort are reported annually to the State. Also see the responses to comments 1-3 and 1-5.

1-8 Please see the response to comment 1-5.

1-9 The NAC reference has been revised. Text in the second paragraph of the referenced section has been modified. Aquatic life criteria have been added to Table 3.4-1 of the Final SEIS.

1-10 There are no Nevada standards for lead in irrigation or stock water.

1-11 Spring locations provided by Eureka County have been added to Figures 3.4-5 and 3.4-6 of the Final SEIS. Zero values in Table 3.4-2 indicate values below the detection limit; a footnote has been added to the table for clarity. Data collection dates for the Sheriff's office spring and Eureka County Mountain spring have been corrected in the table; their exact current locations could not be determined. Also, the NEG for SPLE #8 has been changed to N/A. The water quality standards as identified in the footnotes are the correct standards for this purpose.

Letter 1 Continued

Caleb Hiner | File No. FP BLM 4-4

1-12 Table 3.4-6, page 3.4-22: We are concerned with the following in relation to the need for an ecological risk assessment (ERA) for the pit lake: elevated arsenic in MW-1; the detection limit for mercury (usually 0.2 µg/L) is inadequate for and ERA due to high biomagnification rates in aquatic food chains; the detection limit for selenium (usually 10 µg/L) is inadequate for an ERA due to bioaccumulation in food chains; and some zinc concentrations are elevated.

1-13 3.4.2.1 Proposed Action, Waste Rock Management, page 3.4-24: In the second paragraph, line 4, which BLM (1997) reference is being cited (a or b)? See also page 3.4-25, second paragraph, line 5 and page 3.4-26, line 4.

1-14 3.4.2.1 Proposed Action, Groundwater Impacts, Groundwater Quality, page 3.4-32: The first full sentence at the top of the page which states "The uncertainty of the water quality of the deeper carbonate aquifers increases with pit depth and time" is cause for concern with regard to risk assessment issues for the pit lake. If the water quality cannot be predicted, how can one conduct a reliable ERA. This supports the need for future monitoring (see below).

1-15 3.4.2.1 Proposed Action, Groundwater Impacts, Geochemical Tests, 3.4-33: In line 6, which WESTEC (1996) reference is being cited (a, b, c, or d)?

1-16 Table 3.4-9, page 3.4-34: The first footnote indicates that "Concentrations that are elevated more than 10-fold above typical background concentrations are shown in bold." However, the values for cadmium and mercury appear to meet this criterion, but are not in bold.

1-17 Table 3.4-10, page 3.4-34: Which WESTEC (1996) reference is being cited in footnote 2 (a or b)?

1-18 3.4.2.1 Proposed Action, Pit Lake Formation, Pit Lake Geochemical Model, page 3.4-38 and 42: We strongly disagree with the decision to not require an ERA for the pit lake. Stock water and irrigation standards (i.e., concentrations) tend to be much higher than levels of concern and may not be protective of migratory birds. Also, some constituents readily bioaccumulate (e.g., selenium) or biomagnify (e.g., mercury) in the food chain and are of special concern.

1-19 As a project separate from this SEIS, it would be helpful to conduct retrospective studies of predicted pit lake water quality based on available data prior to filling. This predicted data should then be compared to actual pit lake water quality following filling to determine the accuracy of the model(s) used. Predicted concentrations of metals and trace elements in biota should also be compared to actual concentrations to determine the reliability of the ERA based on the original water quality data.

1-20 It is essential to monitor concentrations of metals and trace elements in aquatic biota during pit filling and following completion of filling in order to determine if migratory birds using a site are at risk from potential elevated exposure.

1-21 3.4.4 Mitigation or Monitoring, page 3.4-42: We disagree with the lack of future monitoring at the pit lake. Please see our comments in the section immediately above.

Responses to Letter 1

1-12 As shown in Table 1-12a, the measured arsenic in MW-1 (197 micrograms per liter [µg/L]) is higher than both the USEPA chronic criterion (150 µg/L) and the Nevada 96-hour standard (180 µg/L) for aquatic life, although it is less than the acute criterion and 1-hour standard (340 and 342 µg/L, respectively). Long-term exposure to this level of arsenic by aquatic organisms could cause sublethal effects, although actual arsenic toxicity data indicate most freshwater species can tolerate much higher concentrations of inorganic arsenic (USEPA 1985). Although the concentration of arsenic in MW-1 is higher than what is predicted to be present in the pit lake, it is still substantially less than the No Observed Adverse Effect Level (NOAEL)-based benchmark values for three species of wildlife (Table 1-12b). The benchmark values from Sample et al. (1996) represent concentrations in drinking water that should not cause adverse effects to the listed species. Therefore, even if wildlife were exposed to this level of arsenic in drinking water, it would not pose a risk to the organisms. In addition, groundwater from the area of MW-1 does not have a strong hydrologic connection to the pit area and, as the modeling conducted by Schafer (2004) indicates, groundwater in the vicinity of MW-1 would have minimal impact on predicted pit lake water quality. Also, groundwater concentrations are not the primary concern when addressing risks to wildlife. If there is not a complete exposure pathway (e.g, surface release of groundwater), risk does not exist. Therefore, it is the anticipated concentrations of chemical stressors in the pit lake, not the concentrations in groundwater, that are of concern when assessing risks to wildlife.

While organic (methyl) mercury has been shown to have a high tendency to both bioaccumulate and biomagnify, the rates are substantially lower for inorganic mercury. The detection limit in most cases (0.2 µg/L) is nearly an order of magnitude lower than the current USEPA acute criterion (CMC) for inorganic mercury (1.4 µg/L) and also is lower than the current USEPA criterion continuous concentration (CCC) for inorganic mercury (0.77 µg/L) (USEPA 2002). The detection limit is above the Nevada State chronic standard for mercury (0.012 µg/L); however, that value is based on the previous USEPA criterion (Gold Book USEPA 1986) and has since been revised (USEPA 2002).

The influence of groundwater chemistry was taken into account in the geochemical modeling of the pit lake. Mercury was not detected at 0.2 µg/L in any of the humidity cell cumulative extracts or simulated pit lake batch test samples, even in the most conservative evapo-concentrated water from the 99-year sample. Therefore, mercury was excluded as a modeled parameter and is not anticipated to be of concern in the pit lake.

Table 1-12a
Comparison of Predicted Pit Lake Water Quality to USEPA CCC Criteria and Nevada Aquatic Life Standards

	3 Years			30 Years			99 Years		
Metal[1]	Predicted Pit Lake Concentration	USEPA CCC (chronic criterion)	Nevada 96-hour (chronic) Standard	Predicted Pit Lake Concentration	USEPA CCC (chronic criterion)	Nevada 96-hour (chronic) Standard	Predicted Pit Lake Concentration	USEPA CCC (chronic criterion)	Nevada 96-hour (chronic) Standard
Calcium[2]	21.8	na	na	20.4	na	na	15.6	na	na
Magnesium[2]	15.5	na	na	18.9	na	na	31.0	na	na
Hardness[3]	118	na	na	129	na	na	166	na	na
Aluminum	<0.3	87	na	<0.4	87	na	<0.5	87	na
Arsenic (III)[4]	10	150	180	9	150	180	15	150	180
Barium	49	na	na	40	na	na	27	na	na
Cadmium	<2	0.3	1.1	<2	0.3	1.2	<3	0.4	1.4
Chromium (VI)[5]	<7	11.4	10	<7	11.4	10	<7	11.4	10
Copper	<2	10.8	11.6	<2	11.6	12.5	<2	14.4	15.5
Iron	<0.5	1,000	1,000	<0.5	1,000	1,000	<0.5	1,000	1,000
Manganese	8.0	na	na	7.5	na	na	5.7	na	na
Nickel	10	60.1	154.3	14	64.5	165.8	23	80.3	206.2
Lead	<0.2	3.9	1	<0.2	4.4	1.1	<0.1	6.1	1.5
Antimony	<3	na	na	<3	na	na	<4	na	na
Selenium	<2	5	5	<2	5	5	<4	5	5
Thallium	<6	na	na	<8	na	na	<13	na	na
Zinc	77	138	103.8	70	148.3	111.5	57	184.5	138.7

[1] Concentrations are µg/L, unless otherwise indicated.
[2] Calcium and magnesium are in mg/L.
[3] Hardness is mg/L as calcium carbonate.
[4] Predicted pit lake concentrations are total arsenic; criteria and standards are for trivalent arsenic.
[5] Predicted pit lake concentrations are total chromium; criteria and standards are for hexavalent chromium.

Table 1-12b
Comparison of Predicted Pit Lake Concentrations to NOAEL-based Wildlife Benchmarks for Consumption of Water

	NOAEL-based Benchmarks for Three Species (mg/L)[1]			Predicted Pit Lake Water Quality (mg/L)		
Metal	Little Brown Bat	Rough-winged Swallow	Great Blue Heron	5 Years	30 Years	99 Years
Aluminum	17.059	471.4	2478.1	<0.0003	<0.0004	<0.0005
Antimony	0.177	--	--	<0.003	<0.003	<0.004
Arsenic	1.114	10.6	55.6	0.010	0.009	0.015
Barium	88.0	89.4	469.9	0.049	0.010	0.027
Cadmium	15.757	6.23	32.76	<0.002	<0.002	<0.003
Chromium	53.58	4.30	22.59	<0.0007	<0.0007	<0.0007
Copper	248.5	202	1061.7	<0.002	<0.002	<0.002
Manganese	1438	4284	22522	0.0080	0.0075	0.0057
Nickel	653.22	332.61	1748.45	0.010	0.014	0.023
Lead	130.68	4.86	25.53	<0.0002	<0.0002	<0.0001
Selenium	3.27	2.149	11.295	<0.002	<0.002	<0.004
Thallium	0.122	--	--	<0.006	<0.008	<0.013
Zinc	2613.7	62.3	327.6	0.077	0.070	0.057

[1] NOAEL-based water consumption benchmarks are the concentration in drinking water that should cause no significant effects to the receptor species (assumes no other exposure sources).

Source: Sample et al. 1996.

Responses to Letter 1

Although selenium detection limits for groundwater samples were higher than the aquatic life standards, it is the predicted concentrations in the pit lake (which represents a potential exposure point) that are important in identifying future risk to wildlife. The selenium concentrations predicted to be present in the pit lake were less than selenium detection limits in all of the modeled years and also less than the USEPA CCC and state standard of 5 µg/L.

The aquatic toxicity of zinc, like some other metals, is dependent upon the hardness of the water in question. The hardness of the groundwater and the (predicted) pit lake water is higher than 100 milligrams per liter (mg/L) as calcium carbonate ($CaCO_3$), which is the default value used by USEPA. Even with a hardness correction, however, zinc levels in the groundwater from some locations are higher than aquatic life criteria or state standards. However, since the exposure point for wildlife would be the pit lake, it is the predicted pit lake water chemistry that is of primary concern. Those data are evaluated in the following paragraphs.

USEPA criteria or Nevada aquatic life standards generally are lower than either Nevada stock watering or irrigation standards. The predicted pit lake concentrations for 5, 30, and 99 years were compared to the USEPA CMC and CCC values and to the Nevada aquatic life standards (Table 1-12a). Criteria and standards for some of the metals are hardness dependent, with the criterion/standard increasing as hardness increases. For these metals (cadmium, copper, lead, nickel, and zinc) the predicted calcium and magnesium concentrations were used to estimate hardness (mg/L as calcium carbonate [$CaCO_3$]). Most USEPA criteria and Nevada state standards are presented as dissolved (rather than total) concentrations. When this comparison is made, the predicted pit lake concentrations are lower then either the USEPA CCC or Nevada 96-hr (chronic) standard. Cadmium was not detected in most of the humidity cell tests, and the predicted cadmium concentration for all modeled years is predicted to be less than the model detection limits (2 µg/L at 5 and 30 years or 3 µg/L at 99 years). Although the model detection limits are greater than the USEPA CCC of 0.3 g/L or the state chronic standard of 1.1 µg/L (at a hardness of approximately 118 mg/L as $CaCO_3$), it is equivalent to the USEPA CMC and less than the state acute standard of 4 mg/L.

To assess whether predicted water quality in the pit lake might cause adverse effects to terrestrial vertebrates that could drink the pit lake water, the predicted water concentrations were compared to the NOAEL benchmarks for drinking water consumption given in *Toxicological Benchmarks for Wildlife* (Sample et al. 1996) (Table 1-12b). Comparisons were made for three species that are more likely than others to contact the pit lake water: little brown bat, rough-winged swallow, and great blue heron. The predicted pit lake water concentrations at all years were lower than the NOAEL benchmarks for these species.

As indicated in Section 3.10.2.1 of the Final SEIS, these evaluations indicate that the predicted water quality of the pit lake would not pose unacceptable risks to wildlife (mammals or birds) or aquatic life. In addition, the pit lake would occur deep in the pit, and the pit walls would be very steep, limiting the pit's access for wildlife and the amount of sunlight that would reach the pit lake. Therefore, the BLM has determined that an ecological risk assessment is not required for the pit lake.

Responses to Letter 1

1-13 The citation in the Final SEIS has been revised to read BLM 1997a.

1-14 Although the water quality may change with depth in the Archimedes Block, it is unlikely that the water quality would change substantially from that observed in existing monitoring wells. The carbonate bedrock would serve to buffer water chemistry. Thus, a substantial change in modeled pit lake chemistry is not expected due to the possible interception of deeper waters. The need for additional pit lake water quality monitoring, beyond that required by NDEP in compliance with Homestake's Water Pollution Control Permit, has not been identified. Should the water quality monitoring required by NDEP identify water quality conditions substantially different from those predicted in this SEIS, Homestake would coordinate with NDEP and NDOW at that time to determine if monitoring of aquatic biota would be necessary.

1-15 The citation in the Final SEIS has been revised to read Westec 1996d.

1-16 The values for camium and mercury in Table 3.4-9 have been bolded for the Final SEIS.

1-17 The citation in the Final SEIS has been revised to read Westec 1996d.

1-18 Please see the responses to comments 1-5 and 1-12 relative to an ecological risk assessment. Please see the revised Table 3.4-1 and text in Section 3.10.2.1 of the Final SEIS relative to aquatic life criteria.

1-19 Based on the predicted pit lake water quality, and evaluation of the water quality in relation to USEPA criteria and Nevada aquatic life standards (see response to comment 1-12), no adverse impacts have been identified. The retrospective study suggested in the comment would be outside the scope of this SEIS.

1-20 Please see the response to comment 1-12. As stated in that response, the evaluations indicate that the predicted water quality of the pit lake would not pose unacceptable risks to wildlife, either mammals or birds. Also see the response to comment 1-14 relative to pit lake monitoring.

1-21 Please see the responses to comments 1-12 and 1-14.

Letter 1 Continued

1-22 3.4.5 Residual Adverse Impacts, page 3.2-44: We believe that there is the potential for residual adverse impacts to migratory birds using the pit lake, but that these potential impacts cannot be determined at this time. Only future monitoring will result in sufficient data to determine if adverse impacts may occur.

1-23 Table 3.9-1, Page 3.9-3: Which WESTEC (1995) reference is being cited in footnote 1?

1-24 Table 3.10-1, page 3.10-5: Which Brown (2004) reference is being cited in footnote 3?

1-25 3.10.1.5 Special Status Species, page 3.10-7: In the third paragraph, line 2, which BLM (2004) reference is being cited (a, b, or c)?

1-26 3.10.1.5 Special Status Species, Birds, Greater Sage Grouse, page 3.10-16: This section states that "The greater sage grouse has been petitioned to be federally listed…" This statement may be updated to indicate that the Fish and Wildlife Service announced a 12 month finding on January 12, 2005. The Fish and Wildlife Service determined that the petition action was not warranted.

1-27 3.10.2.1 Proposed Action, Terrestrial Wildlife, Nongame Species, page 3.10-24: The implementation of mitigation measures to reduce adverse effects to breeding raptors and song birds related to disturbance and/or habitat removal may not be adequate to avoid a violation of the Migratory Bird Treaty Act. Based on the Service's conservation responsibilities and management authority for migratory birds under the Migratory Bird Treaty Act (MBTA) of 1918, as amended (16 U.S.C. 703 *et. seq.*), we are concerned about potential impacts the proposed project may have on migratory birds in the area. Given these concerns, we recommend that any land clearing or other surface disturbance associated with proposed actions within the project area be timed to avoid potential destruction of bird nests or young, or birds that breed in the area. Such destruction may be in violation of the MBTA. *Under the MBTA, nests (nests with eggs or young) of migratory birds may not be harmed, nor may migratory birds be killed.* Therefore, we recommend land clearing be conducted outside the avian breeding season. If this is not feasible, we recommend a qualified biologist survey the area prior to land clearing. If nests are located, or if other evidence of nesting (*i.e.*, mated pairs, territorial defense, carrying nesting material, transporting food) is observed, a protective buffer (the size depending on the habitat requirements of the species) should be delineated and the entire area avoided to prevent destruction or disturbance to nests until they are no longer active.

1-28 3.10.2.1 Proposed Action, Terrestrial Wildlife, Water Quality and Water Quantity, page 3.10-25 and 26: It would be helpful to provide data on past mortality events for wildlife, including migratory birds, in relation to cyanide exposure at the mine.

1-29 The last sentence of the section indicates that "…pit lake development of the post-mining pit lake could result in additional aquatic habitat availability." Such habitats may become attractive to migratory birds. This supports the need for an ERA for the pit lake and future monitoring of metals and trace elements in aquatic biota in the pit lake. We strongly recommend that fish not be introduced into the pit lake unless there is clear evidence for the lack of bioaccumulation

Responses to Letter 1

1-22 Please see the responses to comments 1-12 and 1-14.

1-23 The citation in the Final SEIS has been revised to read Westec 1995b.

1-24 The citation in the Final SEIS has been revised to read Brown 2004a.

1-25 The citation in the Final SEIS has been revised to read BLM 2004a.

1-26 Text has been revised to indicate that in 2005, the USFWS determined that the petition action for this species was not warranted.

1-27 Please see Section 2.3.14.5 of the Draft SEIS, Applicant Committed Protection Measures, bullets 6 and 7, regarding protection for nesting migratory birds.

1-28 There has been an average of less than one cyanide-related wildlife mortality per year during operation of the Ruby Hill Mine. Project design features as discussed in Section 2.3.7 would continue to minimize the potential for wildlife exposure to cyanide solutions. Applicant-committed protection measures also would minimize the potential for wildlife exposure and provide for reporting of any wildlife mortalities (see bullet 4 in Section 2.3.14.5 in the Draft SEIS).

1-29 Being an open water source in an arid environment, it is possible that the pit lake may attract migratory birds. However, water quality in the pit lake is predicted to be good, and there is no evidence that metals and trace elements would be at concentrations of concern. Also see the responses to comments 1-1 and 1-12. The pit lake would be located on private land and access would be restricted for safety reasons. As a result, the BLM has determined that stocking the pit lake with fish would not be appropriate.

Letter 1 Continued

Caleb Hiner — File No. FP BLM 4-4

1-29 and/or biomagnification of contaminants in biota to dietary levels of concern. We are especially concerned with the potential exposure of migratory fish-eating birds to constituents that may biomagnify or bioaccumulate through the food chain (e.g., mercury and selenium).

1-30 3.10.2.1 Proposed Action, Special Status Species, page 3.10-27: Comments provided above regarding the protection of migratory birds (see 3.10.2.1 Proposed Action, Terrestrial Wildlife, Nongame Species, page 3.10-24) also may apply to birds mentioned in this section.

1-31 3.12.2.2 No Action Alternative, page 3.12-3: The last line should specifically cite BLM (1997a). See also similar instances on the following pages: 3.13-3; 3.14-3; 3.14-5; 3.14-5; and 3.15-10.

1-32 Table 3.17-9, page 3.17-12: In the footnote for Source, which Nevada Department of Taxation (2003) reference is being cited (a or b)?

1-33 Table 3.21-1, pages 3.21-2 and 3: We question the response for Water Quality and Quantity regarding no irreversible impacts; we recommend that it be changed to Yes and that the explanation be modified. Pit lake water quality may become degraded for the long term. For Wildlife Resources, the explanation column should also indicate the potential for irretrievable impacts to wildlife from potentially degraded pit lake water quality.

1-34 6.0 References, pages 6-1 through 6-12: The following references were cited in the text, but are not listed here:

Baldrica (1993) - see page 3.15-3;
Drever (1997) – see page 3.4-34; footnote to Table 3.4-9;
Eureka County Economic Development Council (2004) – see page 3.17-1;
Homestake (2003) – see page 2-1;
SMI (1997) – see page 3.4-34; footnote to Table 3.4-10;
U.S. Census Bureau. Population Division. (2002) – see page 3.17-5;
USEPA (1974) – see page 3.14-1; and
USEPA (1995) – see page 3.1-9.
Minnesota IMPLAN Group 1999, on page 6-6 is not in correct alphabetical order.
Also, a few references listed here may not have been cited in the text; however, our search may have been incomplete.

We appreciate the opportunity to comment on this DSEIS. Please contact me or Stanley Wiemeyer at (775) 861-6300 if you have any questions.

Laurie P. Jada
for Robert D. Williams

Responses to Letter 1

1-30 Please see the response to comment 1-27; these measures would apply to all migratory birds.

1-31 The correct citation is BLM 1997a. The citations have been corrected in the Final SEIS.

1-32 The correct citation is Nevada Department of Taxation 2003a. The citation has been corrected in the Final SEIS.

1-33 Please see the responses to comments 1-12 and 1-14.

1-34 The noted references have been added to Chapter 6.0 of the Final SEIS.

Letter 2

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION IX
75 Hawthorne Street
San Francisco, CA 94105-3901

April 25, 2005

Gerald Smith
Bureau of Land Management
Battle Mountain Field Office
50 Bastian Road
Battle Mountain, NV 89820

Subject: Ruby Hill Mine Expansion-East Archimedes Project Draft Supplemental Environmental Impact Statement (SEIS) [CEQ #050087]

Dear Mr. Smith:

The U.S. Environmental Protection Agency (EPA) has reviewed the above referenced document. Our review and comments are provided pursuant to the National Environmental Policy Act (NEPA), the Council on Environmental Quality's NEPA Implementation Regulations at 40 CFR 1500-1508, and Section 309 of the Clean Air Act.

We have rated this Draft SEIS as EC-2 – Environmental Concerns-Insufficient Information (see the enclosed "Summary of EPA Rating Definitions"). Our concerns are based on uncertainties regarding the potential impacts of pit lake water quality on aquatic life and water fowl, potential impacts associated with heap leach closure, and surface water diversion structure design and maintenance. We recommend the Final SEIS provide additional information regarding these issues, including mitigation .

We appreciate the opportunity to review this Draft SEIS and request a copy of the Final SEIS when it is filed with our Washington, D.C. office. If you have any questions, please call me at (415) 972-3854, or have your staff call Jeanne Geselbracht at (415) 972-3853.

Sincerely,

Laura Fujii for

Lisa B. Hanf, Manager
Environmental Review Office

004571

Enclosures

cc: David Gaskin, Nevada Division of Environmental Protection

Letter 2 Continued

SUMMARY OF EPA RATING DEFINITIONS

This rating system was developed as a means to summarize EPA's level of concern with a proposed action. The ratings are a combination of alphabetical categories for evaluation of the environmental impacts of the proposal and numerical categories for evaluation of the adequacy of the EIS.

ENVIRONMENTAL IMPACT OF THE ACTION

"LO" (Lack of Objections)

The EPA review has not identified any potential environmental impacts requiring substantive changes to the proposal. The review may have disclosed opportunities for application of mitigation measures that could be accomplished with no more than minor changes to the proposal.

"EC" (Environmental Concerns)

The EPA review has identified environmental impacts that should be avoided in order to fully protect the environment. Corrective measures may require changes to the preferred alternative or application of mitigation measures that can reduce the environmental impact. EPA would like to work with the lead agency to reduce these impacts.

"EO" (Environmental Objections)

The EPA review has identified significant environmental impacts that must be avoided in order to provide adequate protection for the environment. Corrective measures may require substantial changes to the preferred alternative or consideration of some other project alternative (including the no action alternative or a new alternative). EPA intends to work with the lead agency to reduce these impacts.

"EU" (Environmentally Unsatisfactory)

The EPA review has identified adverse environmental impacts that are of sufficient magnitude that they are unsatisfactory from the standpoint of public health or welfare or environmental quality. EPA intends to work with the lead agency to reduce these impacts. If the potentially unsatisfactory impacts are not corrected at the final EIS stage, this proposal will be recommended for referral to the CEQ.

ADEQUACY OF THE IMPACT STATEMENT

Category 1" (Adequate)

EPA believes the draft EIS adequately sets forth the environmental impact(s) of the preferred alternative and those of the alternatives reasonably available to the project or action. No further analysis or data collection is necessary, but the reviewer may suggest the addition of clarifying language or information.

"Category 2" (Insufficient Information)

The draft EIS does not contain sufficient information for EPA to fully assess environmental impacts that should be avoided in order to fully protect the environment, or the EPA reviewer has identified new reasonably available alternatives that are within the spectrum of alternatives analysed in the draft EIS, which could reduce the environmental impacts of the action. The identified additional information, data, analyses, or discussion should be included in the final EIS.

"Category 3" (Inadequate)

EPA does not believe that the draft EIS adequately assesses potentially significant environmental impacts of the action, or the EPA reviewer has identified new, reasonably available alternatives that are outside of the spectrum of alternatives analysed in the draft EIS, which should be analysed in order to reduce the potentially significant environmental impacts. EPA believes that the identified additional information, data, analyses, or discussions are of such a magnitude that they should have full public review at a draft stage. EPA does not believe that the draft EIS is adequate for the purposes of the NEPA and/or Section 309 review, and thus should be formally revised and made available for public comment in a supplemental or revised draft EIS. On the basis of the potential significant impacts involved, this proposal could be a candidate for referral to the CEQ.

*From EPA Manual 1640, "Policy and Procedures for the Review of Federal Actions Impacting the Environment."

Letter 2 Continued

Ruby Hill Mine Expansion-East Archimedes Project Draft SEIS
EPA Comments – April, 2005

2-1

Water Resources

The Draft SEIS (pp. 3.4-38 to 3.4-42) summarizes the analysis that was conducted to predict post-mining pit lake geochemistry. A range of model predictions under various solubility cases for pit lake water quality over 99 years is provided. The Draft SEIS predicts that pit lake water quality would meet all Nevada stock and irrigation standards. Although fresh water aquatic life often establishes in post-mining pit lakes, fresh water aquatic life standards are not addressed in this analysis. The fresh water aquatic life acute criteria and/or chronic criteria for nickel, arsenic, and zinc are lower than the Nevada irrigation and stock standards for these constituents and lower than the predicted upper thresholds of the pit lake provided on page 3.4-38. EPA numeric criteria may be found at: http://oaspub.epa.gov/wqsdatabase/wqsi_epa_criteria.rep_parameter. Nevada's numeric standards for toxic materials applicable to designated waters can be found at NAC 445A.144 (http://www.leg.state.nv.us/nac/NAC-445A.html#NAC445ASec118). The model predictions in the Draft SEIS do not go beyond 99 years, but concentrations of some constituents would continue to increase beyond 99 years. As aquatic life establishes in the pit lake over time, the fresh water aquatic life standards may be applicable to this water of the State as the result of an established beneficial use. However, it is unclear from the Draft SEIS whether the pit lake would meet these standards.

Moreover, because the water is not expected to exceed stock or irrigation standards, BLM determined that an ecological risk assessment was not needed. The Draft SEIS does not address the potential impacts to aquatic life and water fowl that will use the pit lake. Given the upper threshold predictions for arsenic, nickel, and zinc in the pit lake, and the uncertainties of potential concentrations beyond 99 years, an ecological risk assessment should be conducted to determine the proposed project's potential impacts to aquatic life and water fowl.

Recommendation: The Final SEIS should include the aquatic life standards in Table 3.4-1 and discuss applicability of these standards to waters of the State for which aquatic life will become an actual beneficial use. The Final SEIS should discuss whether the pit lake would meet these criteria over time, including 150 and 300 years after closure. BLM should, at a minimum, conduct a screening level ecological risk assessment to determine the potential impacts to aquatic life and water fowl, and the Final SEIS should summarize its results. We request a copy of the ecological risk assessment as soon as it becomes available.

Recommendation: If the ecological risk assessment predicts potential significant impacts, the Final SEIS and Record of Decision should include a thorough discussion of alternatives and/or mitigation measures that would be implemented to avoid those impacts.

Responses to Letter 2

2-1 BLM acknowledges that some aquatic life criteria (USEPA) and Nevada state water quality standards for the protection of aquatic life are lower than Nevada irrigation or livestock watering standards. (This is not the case with arsenic.) A comparison of predicted pit lake water concentrations to both USEPA aquatic life criteria and Nevada state standards was made; see Table 3.4-1 and Section 3.10.2.1 of the Final SEIS. In all cases, the predicted pit lake water concentrations were lower than the aquatic life criteria/standards and/or were less than the model detection limits. A comparison to wildlife NOAEL benchmarks for two bird and one mammal species also indicated no potential for significant adverse effects. Given this information and the fact that the pit lake would not be accessible (see the response to comment 1-29), the BLM has determined that an ecological risk assessment is not warranted in this case. Also see the response to Comment 1-12. Modeling through year 99 was determined to be adequate for impact analysis purposes, as per suggested procedures stated in BLM Instruction Memorandum NV-2004-031, and as the pit lake is projected to reach hydrologic equilibrium at year 99, after which the pit lake chemistry is predicted to only be marginally affected due to the influx of groundwater and the effects of evapoconcentration.

Letter 2 Continued

2-2

The Draft SEIS indicates that several intermittent drainages would be diverted around the expanded pit and other facilities of the proposed project. The diversions are not included on Figure 2-3, and the Draft SEIS does not discuss whether or how these diversions will be permanently maintained after mine closure.

Recommendation: The diversions should be designed and constructed to ensure post-mining permanency without continuing maintenance. The Final SEIS should depict the proposed diversions on Figure 2-3, and discuss whether and how the diversion structures will be permanently maintenance-free after mine closure. If continuing post-closure maintenance will be required, the Final SEIS should discuss the closure and bonding activities that would be required of the mine operator.

2-3

The Draft SEIS does not evaluate options for, or the impacts of, long-term drain down of the heap leach effluent upon mine closure. BLM has deferred this analysis until two years prior to mine closure. Heap leach facility closure is an important part of overall project closure and should be discussed in the SEIS prior to project decisionmaking. This is to ensure a full and fair discussion of significant impacts associated with heap leach operations is provided in the SEIS. 40 CFR 1502.1.

Recommendation: The Final SEIS should evaluate options for long-term heap leach drain down; discuss the potential impacts associated with each option, including technical and economic feasibility; and identify mitigation measures to avoid environmental impacts. The impacts discussion should provide realistic time frames for each option based on characteristics of the existing heap leach facility. The Final SEIS and Record of Decision should identify the preferred option.

2-4

<u>Air Quality</u>

Table 3.1-4 in the Draft SEIS is a summary of predicted air emissions from the proposed project. The table provides predicted criteria pollutant emissions, including PM10 (particulate matter smaller than ten microns) emissions from point sources at the proposed expanded mine. Predicted fugitive source emissions are missing from this table. Fugitive emissions comprise the bulk of PM10 emitted from mines and should be included in the emissions analysis.

Recommendation: The Final SEIS should include predicted fugitive source emissions in Table 3.1-4.

Responses to Letter 2

2-2 The diversions are in place, and their design was analyzed in the 1997 Ruby Hill Mine EIS and Plan of Operations as well as in the original Ruby Hill Mine Water Pollution Control Permit. The diversions were designed and constructed in compliance with State requirements to withstand, contain, and divert waters from the 100-year, 24-hour storm event. While a 100-year event has not occurred, inspections completed after 25-year storm events as well as annual inspections have determined that no maintenance or repairs have been needed, and no requirements for long-term bonding have been identified. Modifications to these channels, if required as part of the expanded operations, would be to the same specifications as the existing approved designs. The text in the Final SEIS has been revised to correctly indicate that the existing water diversion ditches are presented in Figure 2-3.

2-3 Homestake has reviewed the physical, geochemical, and hydraulic performance of their existing Ruby Hill Mine heap leach facility and developed conceptual draindown management options based on that information. Management options currently being utilized elsewhere in the mining industry also were considered as well as specific local site conditions. Depth to groundwater in the area immediately below the leach pad is approximately 380 feet. The aquifer is in limestone at that depth, which is overlain by native alluvial material varying from approximately 100 to over 300 feet thick. The nearest domestic groundwater well is approximately 2.5 miles northeast of the existing leach facility.

Based on observed performance of the existing Ruby Hill Mine heap leach facility and physical characteristics of the material, draindown from the heap leach pad is expected to decrease by greater than 95 percent within 2 years of cessation of active leaching, and by over 99 percent by year 10. Long-term solution flows are anticipated to be less than 1 gallon per minute (gpm). Potential long-term solution management options at Ruby Hill include enhanced evaporation in the existing lined ponds, evapotranspiration cells in the lined ponds, land application and/or infiltration through native alluvium, a combination of one or more of the above, or potentially another NDEP-approved method yet to be developed. Given the minimal size requirements associated with the less than 1 gpm flow rate, it is anticipated there would be adequate room to construct the selected solution management method adjacent to the Ruby Hill leach facility, on private land owned by Homestake.

BLM and NDEP have considered the potential heap leach closure options proposed by Homestake, and they do not see the potential for significant environmental impacts or mitigation given the site location, minimal long-term flows, high evaporation rate, depth to groundwater, and natural attenuation characteristics of the native alluvial material. Additionally, adequate space exists on private land owned by Homestake to construct and operate any likely future management options approved by NDEP.

It is understood that the science of managing long-term heap leach pad draindown has evolved significantly over the past decade and will continue to do so in the coming years. This is recognized by both the BLM and NDEP and is largely the reason State of Nevada regulations do not require final closure designs until 2 years prior to anticipated closure, ensuring the most recent and applicable technology is utilized. NDEP has primacy and designated authority to protect waters of the State, and would apply this authority when reviewing Homestake's selected long-term solution management plan at that time and as required by the State water pollution control permit program. Development and issuance of these permits are subject to public review and comment.

Responses to Letter 2

In consideration of this State permitting program for heap leach closure and the required monitoring that would be imposed by that program, BLM does not feel it is appropriate to select a specific option as a preferred alternative for long-term draindown management at this time. In the interim, Homestake will post adequate bonding for the entire site, to include a short-term solution management bond as per State of Nevada regulations, in an amount agreed upon by both NDEP and BLM.

2-4 Fugitive source emissions (PM_{10}) have been added to Table 3.1-4 in the Final SEIS.

Letter 3

United States Department of the Interior

U. S. GEOLOGICAL SURVEY

Reston, VA 20192

In Reply Refer To:
Mail Stop 423
NV063EIS04341790
NVN0677823809

April 20, 2005

RECEIVED
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2005 APR 25 A 11: 56
BUREAU OF LAND MANAGEMENT
BATTLE MOUNTAIN
FIELD OFFICE

MEMORANDUM

To: Bureau of Land Management
Battle Mountain Field Office, Battle Mountain, Nevada

From: Lloyd H. Woosley, Jr. Chief */Signed/*
Environmental Affairs Program

Subject: Review of Draft Supplemental Environmental Impact Statement for the Ruby Hill Mine Expansion

3-1 The U.S. Geological Survey has reviewed the draft environmental impact statement and has no comments.

Cc: EAP Chron, MS 423
USGS:WRD:LWOOSLEY:bjjohnso:x6832:04/20/05

Responses to Letter 3

3-1 Comment noted.

Letter 4

KENNY C. GUINN
Governor

RECEIVED
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2005 APR 25 P 12: 09

BUREAU OF LAND MANAGEMENT
BATTLE MOUNTAIN
FIELD OFFICE

STATE OF NEVADA

JOHN P. COMEAUX
Director

DEPARTMENT OF ADMINISTRATION

209 E. Musser Street, Room 200
Carson City, Nevada 89701-4298
Fax (775) 684-0260
(775) 684-0213

April 19, 2005

Mr. Gerald Smith
Bureau of Land Management
Battle Mountain Field Office
50 Bastian Road
Battle Mountain, NV 89820-1420

Re: SAI NV # **E2005-210** Reference: **NV063-EIS04-34 1790 NVN067782 3809**

Project: **BLM Battle Mountain FO Ruby Hill Mine Expansion**

Dear Mr. Gerald Smith:

Thank you for the opportunity to review the above referenced project.

4-1 The State Clearinghouse, as per Executive Order 12372, has processed the proposal and has no comment. Your proposal is not in conflict with state plans, goals or objectives. If you have any questions, please contact me at (775) 684-0209.

Sincerely,

Reese Tietje
Nevada State Clearinghouse Coordinator/SPOC

Responses to Letter 4

4-1 Comment noted.

Letter 5

April 29, 2005

Gerald Smith
Field Office Manager
Bureau of Land Management
Battle Mountain Field Office
50 Bastian Road
Battle Mountain, NV 89820

RE: Draft Supplemental Environmental Impact Statement, Ruby Hill Mine Expansion East Archimedes Project, Homestake Mining Company - BLM

Dear Mr. Smith:

5-1 We appreciate the opportunity to review and provide comments on the subject document. On page 3.10-26, the document indicates the pit lake development could result in additional aquatic habitat. This has the potential to be significant for the public and wildlife resources in the vicinity of the pit lake. In fact, if it is designed and constructed properly, the pit lake has the potential to be a significant recreational site for wildlife and the public. The Department of Wildlife believes this concept should receive more in depth evaluation in relation to this proposed action. This pit lake will ultimately support use by both people and wildlife. It would be much more realistic to accept this fact and plan to create a functional site that deals with this issue.

5-2 On page 3.10-32, Measure W1 suggests a mitigation activity for pygmy rabbits. We would suggest a similar survey be conducted for burrowing owls. If you should need any additional information or have any questions concerning this information, please feel free to call me.

Sincerely,

Rory E. Lamp
Biologist III
60 Youth Center Road
Elko, NV 89801
(775) 777-2368

RL/rl
cc: Habitat Bureau
Nevada State Clearinghouse
Eureka Field Office, NDOW
File

C:\Documents and Settings\scoughenour\Local Settings\Temporary Internet Files\OLK68\NDOW 0405 (2).doc

Responses to Letter 5

5-1 As discussed in Section 3.12.2.1 of the Draft SEIS, public lands in the project area would be returned to their pre-mining land use, with the exception of a portion of the pit expansion area (approximately 25 acres of public land) that would be restricted for safety reasons. The privately owned lands in the mine area, including the remainder of the pit expansion area, would remain under private ownership and would not be available for public recreation.

5-2 Text has been added to bullet number 6 in Section 2.3.14.5, Applicant-committed Environmental Protection Measures, of the Final SEIS to clarify that the protection measures for raptor species would apply to burrowing owls.

Letter 6

EUREKA COUNTY
DEPARTMENT of NATURAL RESOURCES
PO BOX 682
EUREKA, NV 89316

TELEPHONE: (775) 237-6010 FAX: (775) 237-6012

To: **Bureau of Land Management**

From: Rosie Bliss, Administrative Assistant RB

Date: 4/21/2005

Re: Comments to Ruby Hill Mine Draft SEIS

The Board of Eureka County Commissioners formally approved transmittal of these comments to the Ruby Hill Draft SEIS on April 20, 2005. Please accept them for consideration into your final draft of the East Archimedes Project.

Letter 6 Continued

Eureka County NEPA Committee Comments on the Draft Supplemental EIS for the Proposed Ruby Hill Mine Expansion

Consideration of BLM's response to Preliminary Draft comments

6-1 Page 2-2, Figure 2-1: BLM's Master Title Plats need to be updated. Mr. Ithurralde, Eureka County Assessor, assures this committee that the plats in question (those owned by Mr. Ithurralde and Eureka County) and all other plats in Eureka County are readily obtained from the Assessor's Office (775.237.5270) in electronic format.

6-2 Page 2-3, Line 77: We recognize that there is some uncertainty in the measurements in question; however, discussions with Ruby Hill Mine Environmental Manager confirm that the expanded pit will be closer to the townsite than the existing pit by some 1,200'. Please recognize this fact in the EIS.

6-3 Page 3.4-13, Line 326: Faults bounding the Archimedes Block may be based on mapping and drill log interpretation as presented in the WMC report; however, unless the analysis is summarized in the present EIS, it remains unclear what geological structure bounds the Archimedes Block to the north. We reiterate that the northern boundary is important, because it may control ground water flow from the bedrock formation into the alluvial aquifer that supplies Eureka County's community water supplies and the many domestic and irrigation wells in southern Diamond Valley.

6-4 Page 3.4-14, Line 358: As noted above, please summarize what the WMC, 2004 and Schafer, 2004 have to say about hydraulic communication between the Powerline Block and Diamond Valley alluvium. We reiterate that this has bearing on interpretation of ground water flow between other carbonate units and Diamond Valley alluvium. Do the analyses indicate whether the carbonate units recharge the overlying alluvial aquifer or vice versa?

6-5 Page 3.4-17, Figures 3.4-5 and 3.4-6: We recognize that BLM designated the area of potential impact based on the estimated 10' equipotential lines generated in the Regional Affects Model of dewatering and reinjection. We understand that the reasoning has to do with the inability to resolve smaller changes in ground water level from annual fluctuations caused by irrigation pumping. Wells inside the 10' equipotential lines are accurately listed in Table 3.4-4. Our concern is that by selectively mapping wells as in Figures 3.4-5 and 3.4-6, BLM gives an inaccurate depiction of the density of wells in the mapped area. Specifically, the figures suggest that the density of wells inside the impact area is greater than the density of wells outside the area. The opposite is true, because there are a substantial number of domestic and irrigation wells that do not appear on the map. We believe that, as a matter of accuracy and full disclosure of regional impacts, Figures 3.4-5 and 3.4-6 should depict the full suite of springs and wells in the mapped area. The Board of Eureka County Commissioners wishes to emphasize the importance of accurately mapping well and spring locations.

6-6 Page 3.4-24, Surface Water Impacts: As per our response to the preliminary EIS, BLM must be aware that Eureka County is very concerned about potential impacts to seeps and springs. This concern is based on the fact that County citizens have rights to

Responses to Letter 6

6-1 Geographic information system title plat information has been obtained from Eureka County; land ownership in Figure 2-1 of the Final SEIS has been updated accordingly.

6-2 The 1997 FEIS and this SEIS reference approximate distances from the Ruby Hill project area to the town of Eureka, not specific distances from a particular object. Text has been added to Section 2.3.2.1 of the Final SEIS to indicate the closer proximity of the East Archimedes Pit to the Eureka townsite. The location of the pit expansion area in relation to the Eureka townsite has been taken into account, where appropriate, in the impact analyses (e.g., noise and blasting).

6-3 The Archimedes Block is bounded on the north by an unnamed northeast trending fault that separates the Archimedes Block from the Porcupine Block to the north. There is geologic evidence to suggest a major downthrown fault block to the northeast of the Archimedes Block suggesting that groundwater flow from the Archimedes Block across the fault bordering the block on the north would be limited.

6-4 Data from wells MW-03 and MW-05 in the Powerline Block show seasonal trends in water levels that parallel seasonal trends observed in alluvial wells in southern Diamond Valley. This suggests a direct hydraulic connection between the alluvial groundwater and bedrock groundwater in the Powerline Block. In addition, hydrogeologic data collected throughout the mining district (WMC 2004) support the conclusion that local groundwater flow is from the bedrock to the alluvium.

6-5 Figures 3.4-5 and 3.4-6 in the Final SEIS have been revised to include well locations and spring locations provided by Eureka County.

6-6 Please see the response to comment 6-5. The spring locations noted in the comment fall outside of the projected 10-foot groundwater drawdown area. The springs are not in the Archimedes Block and thus are not likely hydraulically connected to the Archimedes Block because of intervening blocks and faults. Thus, dewatering of the Archimedes Block is not expected to affect the springs.

It should be noted that groundwater levels fluctuate seasonally in Diamond Valley by up to 10 feet. Therefore, it would be difficult to separate a 10-foot drawdown in water levels due to mine dewatering from seasonal fluctuations in water levels. As a result, the modeled 10-foot drawdown contour has been used as the outer boundary for impact assessment purposes. To confirm the modeled drawdown projections, Homestake has committed to installing two new monitoring wells for tracking groundwater levels during operations (see the applicant-committed environmental protection measure in Section 2.3.14 of the Draft SEIS).

Letter 6 Continued

6-6 divert spring waters that emanate from the ground near the proposed dewatering operation. These springs are located within or just outside the 10' drawdown area (e.g. NW SW Sec 13 T19N R53E, NW SW Sec 5 T19N R54E). The argument that the seeps or springs are upgradient from the aquifer being pumped has no bearing on whether they will or will not be impacted. Rather, it is hydraulic connection that is at issue. Outside of the highly compartmentalized hydrologic units that characterize the mine site, water level elevation generally increases with increasing land surface elevation. As a result, a seep or spring up-gradient from the mine site water level elevation must be assumed to be hydraulically connected to the regional ground water system unless a physical barrier (*i.e.*, surface expression above the local ground water table or local compartmentalization) is identified. A reasonable solution to our concern is to disclose the location of all seeps and springs that lie within the mapped area of Figures 3.4-5 and 3.4-6 and indicate that, because the seeps and springs lie outside the 10' drawdown area, BLM believes that impacts will be nil. Eureka County is pleased to supply the necessary information.

6-7 Page 3.4-27: The DEIS is improved by disclosure of potential ground water quantity impacts beneath the town of Eureka; however, the disclosure is insufficient in stating that "…due to the type of geologic material under the town (volcanic and carbonate bedrock), no subsidence-related affects would be anticipated in this location." The material directly underlying the central portion of the townsite (on which is situated the Eureka Historic District, which includes the Eureka Opera House and Eureka County Courthouse) is partially saturated un-consolidated alluvium. These shallow aquifers are likely to be in hydraulic connection with the underlying hard-rock aquifers that will be dewatered. Changes in hydraulic gradient between these aquifers may result in dewatering of the alluvium and cause subsidence-related damage to the buildings in the Historic District. We recommend that BLM pursue additional analysis of this scenario and consider our recommendation for Mitigation and Monitoring provided in 3.4-44 below.

6-8 Page 3.4-44, Line 924: Potential Mitigation and Monitoring: Clarifications of water quality and quantity mitigation that appear in the DEIS are appreciated. Following the discussion above, Eureka County suggest that BLM expand the Mitigation and Monitoring section in 3.4-42 to include monitoring of ground water levels in wells completed in the shallow alluvium beneath the Eureka townsite. Eureka County and Ruby Hill Mine have expanded their existing monitoring agreement to include approximately six existing monitoring wells owned by Eureka County and at least one new well to be developed by Ruby Hill Mine. Monitoring of these wells should be stipulated in the EIS. In addition, the stipulation that Homestake will monitor water levels in at least two deep ground water wells in the townsite should explicitly identify the Atlas well and Elementary School well.

Additional editorial comments to DEIS

6-9 Page 3.2-7, Figure 3.3-2: Scale on right side of figure should be 4,500 feet rather than 3,500 feet.

6-10 Page 3.4-29, Figure 3.4-7: There is no scale associated with this figure. Are units in feet?

Responses to Letter 6

6-7 Based on the supplemental report prepared for Homestake by Water Management Consultants (2005) titled *Evaluation of Hydrologic Conditions near the Eureka Town Site and the Potential Relationship to Proposed Ruby Hill Mine Dewatering Operations*, there would be no substantial decline in water levels in either the bedrock or alluvial aquifers beneath the town of Eureka. This conclusion was based on two principal facts: 1) the bedrock block below the town of Eureka is composed mostly of volcanic rock of low permeability, and 2) the drawdown due to pit dewatering would be in the carbonate bedrock. The various bedrock hydrologic blocks at the Ruby Hill Mine are for the most part hydrologically isolated from one another. This is especially true of the volcanic bedrock blocks versus the carbonate blocks. As a result, drawdown in the carbonate blocks would have minimal impact on the volcanic bedrock blocks. Thus, subsidence beneath the townsite is considered unlikely. However, Homestake has committed to installing two new groundwater level monitoring wells in the southern end of Eureka as recommended in the supplemental Water Management Consultants (2005) report referenced above. Information from these wells would be shared with Eureka County per their request. See Mitigation Measure W3 in Section 3.4.4 of the Final SEIS.

6-8 Based on discussions with Eureka County, Homestake has committed to monitoring several existing wells within the town of Eureka; see the revised Mitigation Measure W1 in Section 3.4.4 of the Final SEIS. Please also see the response to comment 6-7.

6-9 The scale on Figure 3.2-2 (mislabeled as 3.3-2 in the comment) has been corrected for the Final SEIS.

6-10 The projected subsidence contour intervals in Figure 3.4-7 are in feet, as noted in the legend of the Draft SEIS figure.

Letter 7

Elko County Board of Commissioners
569 Court Street • Elko, Nevada 89801
775-738-5398 Phone • 775-753-8535 Fax

COMMISSIONERS
SHERI EKLUND-BROWN
JOHN ELLISON
CHARLIE MYERS
MIKE NANNINI
WARREN RUSSELL

ELKO COUNTY MANAGER
ROBERT K. STOKES
rstokes@elkocountynv.net

April 22, 2005

RECEIVED
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2005 APR 25 P 12: 05
BUREAU OF LAND MANAGEMENT
BATTLE MOUNTAIN
FIELD OFFICE

Ms. Pam Jarnecke, Project Manager
BLM - Battle Mountain Field Office
50 Bastian Road
Battle Mountain, Nevada 89820-1420

RE: Ruby Hill Mine Expansion - East Archimedes Project
Draft Supplemental Environmental Impact Statement
SEIS Number NV063-EIS04-34
Plan of Operation Number NVN-067762

Dear Ms. Jarnecke:

7-1 The Elko County Board of Commissioners supports the proposed action of the Draft Supplemental Environmental Impact Statement that will allow the Homestake Mining Company requested Ruby Hill Mine Expansion - East Archimedes Project to proceed. The proposed action has an expected life of seven years. Most of the project disturbance is within the existing footprint of the mine. We believe that this action will allow Homestake Mining Company to productively utilize the mine site in a way that is consistent with wise management of public lands.

Sincerely,

Elko County Board of Commissioners

Robert K. Stokes
Elko County Manager

www.elkocountynv.net

Responses to Letter 7

7-1 Comment noted.

Letter 8

Great Basin Mine Watch

Reno headquarters:
505 S. Arlington Ave., # 110
Reno, NV 89509
775-348-1986; fax 775-337-2980
gbmw@greatbasinminewatch.org
www.greatbasinminewatch.org

Las Vegas office:
1700 E. Desert Inn Road, # 406
Las Vegas, Nevada 89109
702-413-1517

April 22, 2005

RECEIVED
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BUREAU OF LAND MANAGEMENT
BATTLE MOUNTAIN
FIELD OFFICE

Bureau of Land Management
Attn: Caleb Hiner
Battle Mountain Field Office
50 Bastian Road
Battle Mountain, Nevada 89820

Re: Ruby Hills DSEIS Comments

Dear Mr. Hiner:

On behalf of Great Basin Mine Watch, please accept the enclosed comments prepared by Dr. Tom Myers, hydrologic consultant to GBMW. These comments are sent prior to April 25, 2005, and are therefore timely.

Thank you very much.

Sincerely,

Tom Myers
for
Elyssa Rosen
Executive Director

Letter 8 Continued

Review of
Draft Supplemental Environmental Impact Statement
Ruby Hill Mine Expansion: East Archimedes Project
NV063-EIS04-34

Technical Report 2005-05-GBMW

April 18, 2005

Prepared for:

Great Basin Mine Watch
505 South Arlington Ave., Ste. 110
Reno, NV 89509

Review Prepared by Tom Myers, Ph.D.
Hydrologic Consultant
200 Bartlett St.
Reno, NV 89512
775-530-1483
tommyers@gbis.com

Letter 8 Continued

Introduction

8-1

Located within two miles of the townsite of Eureka Nevada, the Ruby Hills Mine proposes to substantially expand. The Ruby Hills East Archimedes pit expansion will increase the existing pit depth by 600 feet to a total depth of 1100 feet; the pit bottom will be 570 feet below the ambient groundwater level. The pit will extend below the groundwater table and require dewatering which the DSEIS predicts to be less than 1000 gallons per minute (gpm). The pit will fill and have a surface area of 62 acres which will evaporate at 142 gpm. The pit lake volume will be about 13,000 acre-feet (af) after about 40 years.

Dewatering is the biggest issue at this mine because it will occur in a State Engineer designated closed hydrologic basin. This means that irrigation pumpage and certificated water rights far exceed the natural recharge and that the groundwater levels are currently dropping. This review focuses on issues regarding hydrogeology and pit dewatering. The review of the DSEIS has been supplemented where possible with review comments of WMC (2004), Schaeffer (2004) and Jones (2004) which were provided by the Battle Mountain BLM.

There is a section of general comments provided at the end.

General Hydrogeology

8-2

The existing mine and proposed expansion lie in the far southeast corner of the Diamond Valley basin. Groundwater flow in the Ruby Hills mine region is controlled by faulting. Most of the bedrock is carbonate or volcanic (Jones, 2004).

The Diamond Valley Hydrologic Basin is overappropriated for irrigation. The average annual pumping rate is about 64,000 acre-feet/year (af/y). Recharge is 30,000 af/y. About 20-25% of the irrigation water seeps back into the aquifer due to overirrigation. Because of this excess of pumping and yield, the water level has declined about 70 feet over the past 35 years (Jones, 2004, page 15). Near the project area, the water level in the alluvium has dropped at a 1 foot/year rate.

The DSEIS and supporting documents rely on assumptions about the aquifers in the region being divided into hydrologic blocks due to the substantial northwest and northeast trending faults. Some of the northwest faulting preceded the gold intrusion meaning that the ore body is partly dissected by faults. Other thrust block faults which trend northeast are post intrusion. The Holly and 150 faults separate the ore body from parts of the Diamond Valley basin lying west and northwest of the mine.

8-3

The DSEIS and supporting documents make most assumptions about site hydrogeology, including faulting, based on a 45-day pump test that commenced November 23, 2003. The pumped well located in the middle of the existing pit. Screens were installed at three different levels (160 to 260, 320 to 520, and 580 to 660 feet, respectively), but we did not locate the lithology corresponding to these levels (there was no log, only construction details, provided in the documents). Table 3.2 (WMC, 2004) provides the lithology of the monitoring wells. WMC (2004, pages 32-35) interprets the results of the pump tests.

Responses to Letter 8

8-1 Comment noted.

8-2 Comment noted. The statement in the comment that the aquifers are divided into hydrologic blocks based on assumptions is not correct. Drilling data, water levels in monitoring wells, and the behavior of the monitoring wells during the 45-day pump test demonstrate the segregation of the carbonate rock into blocks with each block having its own distinct water levels and behaving mostly as a separate aquifer unit. This is common in mining areas.

8-3 The comment requests more data on the geology of the well used in the 45-day pump test. Figure 8-3 in the responses to this letter represents a diagram of the lithology of the pumping well (PW-1) used in the 45-day test, including the three screened intervals. Pumping at an approximate 120 gpm for 45 days while less than originally expected, is considered sufficient stress on the bedrock aquifer for a drawdown test based on the strong response shown.

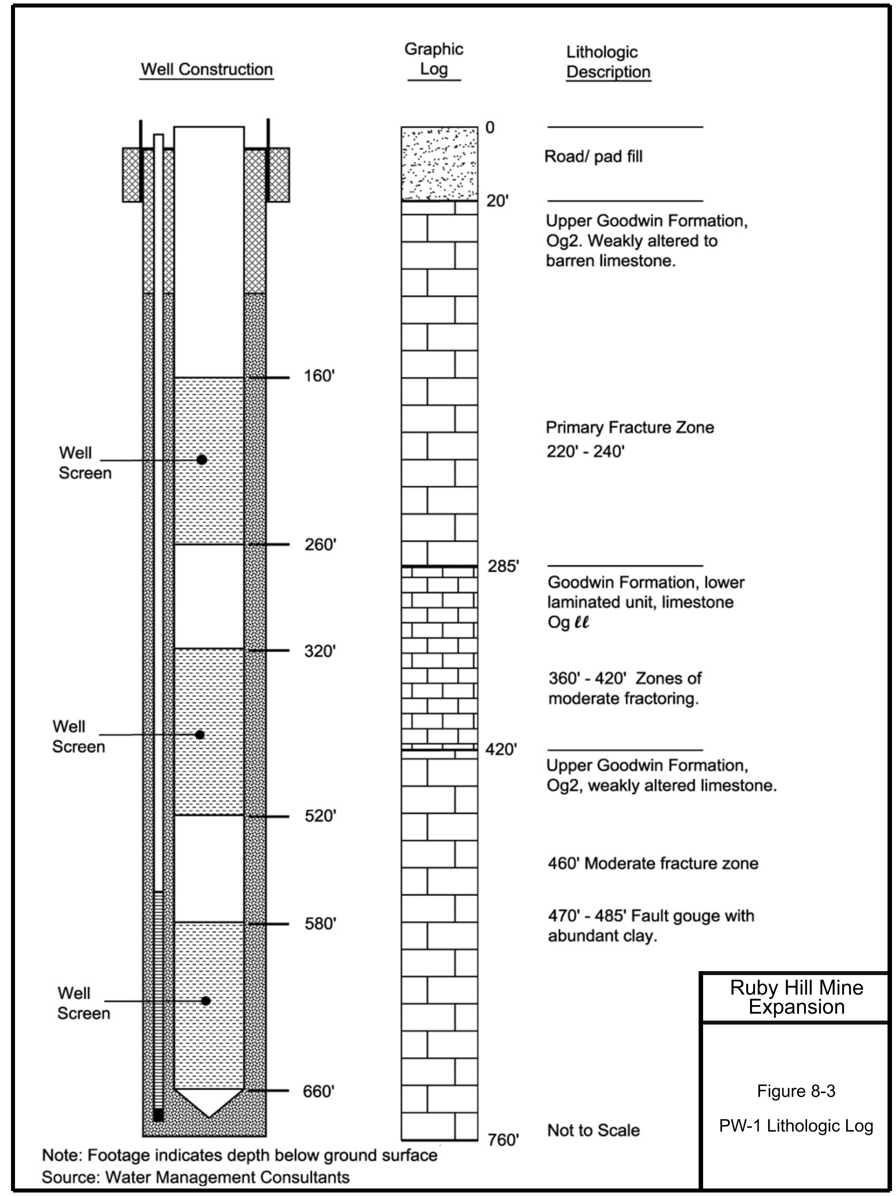

Figure 8-3

PW-1 Lithologic Log

Letter 8 Continued

8-3 The pump test may have insufficiently stressed the aquifers and the effects of actual dewatering based on the pump test may be limited. During construction, production well, PW-1, encountered a clay zone which WMC (2004, page 18) indicates limited the production from the well to less than 200 gpm rather than the expected 400 to 500 gpm range. Because WMC expects the clay was anomalous, a new test well should be constructed the entire test should be completed again.

8-4 The test well, as noted, was screened over three different levels. WMC (2004, page 18) indicates these levels correspond to zones of maximum potential production. The intervening layers are likely semi-confining, therefore test pumping drew from three separate aquifers. Because the test did not measure the flow rate from each level and because there is no evidence about which pumping level corresponds with which monitoring well level, the interpretations will be fraught with doubt. Although the pumpage may be from a wide geologic layer, the wells monitor relatively thin layers. Many additional monitoring wells would have been necessary to truly understand the effects of the pumping. Each monitoring well should have had screens installed over at least the three most productive layers so that they could be separately monitored. These would have been multiple completion wells; alternatively, separate monitoring wells could have been completed for each layer. This would have yielded information about differential responses among layers rather than the integrated responses resulting from this test.

8-5 WMC (2004, page 34) indicates fours wells, HRH-1724, HRH-1726, BRh-02 and BRH-03, responded substantially and quickly to the pumping. The first two are within 1000 feet of and completed within a couple hundred feet of the bottom of the pumping well. The second two monitoring wells are further from and completed more than 1000 feet below the bottom of the pumping well. All are within carbonate rocks (Jones, 2004, Table 1.1) within the Archimedes block. The effects of dewatering the pit may therefore extend to significant depth below the pit; there must be a connection between the deep and shallow confined aquifers.

8-6 Monitoring wells HRH-1205, -1413, -1725, -1729 and MW-06 responded substantially but still less than those above. These wells were completed higher than the others above, but still in the Archimedes block to the NE and E of the existing pit. HRH-1205, though, was completed in volcanic rock (Jones, 2004). The different response between this set of wells and the previous set indicates horizontal anisotropy exists in the bedrock; the drawdown response may extend to the northwest quicker than to the northeast and the lower bedrock may dewater faster than the upper bedrock. This could be due to fracturing concomitant to the faulting.

8-7 There is just one test well across the Holly Fault in the Williamsburg block adjacent to the pumped block. HRH-444 water levels dropped 3.7 feet due to the pump test. This monitoring well was 2175 feet from PW-1 and is screened in carbonate rock at around 5600 feet MSL, or a few hundred feet above the bottom of PW-1. Figure 4.12 shows that the response was slow and the recovery had not even commenced by the time that monitoring ceased, about 6 weeks after the end of the test. This indicates that a direct stress imposed to the Archimedes block will affect water levels in the Williamsburg block. This counters the statement in the DSEIS (page 3.4-11) that the Holly-150 fault is a "barrier to the lateral movement of groundwater". Even though the DSEIS references WMC (2004) as its source for this statement, WMC (2004, page 34, emphasis

Responses to Letter 8

8-4 The monitoring wells used during the 45-day pump test were not screened in a manner similar to the screened intervals in the pumping well; therefore, the data gathered result in a qualitative interpretation of drawdown in a monitoring well. However, the purpose of the 45-day pumping test was to determine the extent of drawdown in various geologic formations affected by the East Archimedes Pit and to determine the water quantity that would be pumped during mine production. The pumping test accomplished these objectives.

8-5 Based on existing data and the 45-day pump test, there appears to be a connection between the deep and shallow aquifers. As stated in the comment, wells BRH-02 and BRH-03 showed substantial response to pumping and are screened more than 1,000 feet below the bottom of the pumping well.

8-6 The structural blocks in the East Archimedes area are strongly fractured in at least two major directions. This fracturing has resulted in structurally controlled secondary porosity within these blocks. Consequently, drawdown during pumping would reflect this anisotropic nature of the bedrock and would not be uniform in any given block. The groundwater model accounted for this structural variability.

8-7 The term "barrier" to groundwater flow was not intended to imply a wall that stops all flow, as no fault is a complete barrier to flow. To avoid confusion, the Final SEIS has been revised to state that the Holly Fault is present as a "restriction" to lateral groundwater flow.

Letter 8 Continued

8-7 added) states "that the Williamsburg block contributed groundwater to the Archimedes block, **as a result of leakage through the Holly Fault**". WMC (2004, page 35, emphasis added) indicates that the slow recovery in adjacent blocks, as observed at HRH-444, is due to "**continued leakage into the Archimedes block** to balance the head differences across the block boundaries". In the section concerning the geology of faults, WMC (2004, page 10, emphasis added) states that "[w]ithin the zone of the Archimedes deposit, it appears that the Holly-150 Fault restricts the lateral movement of groundwater **to some degree**..." The pump test results showing that HRH-444 water level dropped about 4 feet while other well levels at a similar distance from PW-1 but still within the Archimedes block dropped over 10 feet indicates that there is a restriction to the leakage. **The fault is not a barrier to flow, but it does slow it. The DSEIS appears to have misquoted its own reference. Reliance on this fault as a major barrier to flow may provide a false sense of security regarding the extent of the impacts of groundwater dewatering.** This will be discussed more in the section on dewatering and groundwater modeling.

8-8 Responses from the Bowman block were monitored in the Fad Shaft. This is a poor monitoring point because its primary inflow during construction and dewatering attempts, as discussed in WMC (2004), was very deep as compared to the levels associated with open pit mine dewatering. Even a substantial connection to the pump test at a level higher than that which was inputting 9000 gpm during mining will be swamped by the higher flows occurring at deeper levels. The pump test does not provide proof of no connection to the Bowman block.

8-9 Other monitoring wells, mostly completed in different blocks, responded much less to pumping. There is little indication that a substantial hydraulic connection exists between the Archimedes and the other surrounding blocks.

8-10 The DSEIS does not, and should, discuss the water rights associated with the dewatering of this project. Neither WMC (2004) nor Jones (2004) discusses water rights either. The DSEIS only mentions that Homestake owns water rights totaling 1100 af that had been used for the Collingwood Ranch. Will these rights be transferred to the location of the open pit? It is a change in the point of use which must be approved by the Nevada State Engineer. Diamond Valley is a designated basin in which no additional irrigation rights are being granted. The Nevada State Engineer, in order 277o, designated Diamond Valley; it includes the entire township in which the Ruby Hills Mine lies. The State Engineer, in order 541o closed the basin to further irrigation rights.

> Whereas, the U.S. Geological Survey estimates that 30,000 acre-feet of water annually are available as a perennial yield from the Diamond Valley Ground Water Basin. Existing ground water rights of record in the State Engineer's office total 127,526 acre-feet per year for the irrigation of 32,650 acres. Approximately 17,000 acres were irrigated during the 1975 irrigation season... Whereas, the State Engineer has found that the ground water is being depleted in portions of the basin, particularly in the agricultural areas south of the South Boundary Line of Township 22 North, M.D.B.&M....it is ordered that ... all applications ... south of the South Boundary Line of Township 22 North ... will be denied. (Nevada State Engineer Order 541o)

Responses to Letter 8

8-8 It is agreed that the Fad Shaft is not an ideal monitoring point for a pumping test due to its underground workings. However, the drawdown in the Fad Shaft was presented to show the limited connection between the Bowman and Archimedes blocks.

8-9 The comment correctly reflects the information stated by WMC (2004) and in the SEIS relative to the limited interconnection between the Archimedes Block and blocks more distant from the area of the East Archimedes Pit.

8-10 As pointed out in Table 1-1 of the Draft SEIS, permits and approvals for point of diversion changes will be required and addressed by the Nevada Division of Water Resources; this is an issue that is applicable to the State permitting process rather than NEPA. The State Engineer has the responsibility and authority to review and approve these changes according to existing State law.

Letter 8 Continued

8-10 The south boundary of township 22 north is less than 10 miles north of the site. All irrigation rights in the region south of T22N, including the mine site, are being denied. The basin has apparently also not been adjudicated because of the controversy caused by the extent of over-appropriation. Adjudication may cause some water rights holders to lose their water rights. Dewatering for this mine represents a major change in the hydrology of an overappropriated area and the DEIS does not even discuss it. The hydrology technical reports (WMC, 2004 and Jones, 2004) also do not discuss water rights.

The DSEIS should therefore discuss the water rights and the effects of this project on water rights. A map and listing of all rights in the basin or at least all rights in portion of the basin south of township 22N should be included. The well inventory on DSEIS page 3.4-16 does not suffice. The DSEIS should discuss why the current irrigation causes a 1 ft/y drop in water levels in the vicinity of the project. The DSEIS should also discuss whether the dewatering and subsequent pit lake will reduce the effective recharge in the basin through the interception of groundwater flow, the filling of the pit lake, and subsequent evaporation.

Dewatering

Because the mine will extend almost 600 feet below the groundwater table, four dewatering wells will be constructed to dewater at rates predicted to be less than 1000 gpm.

8-11 The mine proposes to reinject or infiltrate the dewatering water into the alluvium of DiamondValley northwest of the mine. In general, returning dewatering water to the source basin is a positive mitigation. The water should be placed into the basin so that it may return to replenish the drawdown cone and pit lake caused by the project. In this case, both the wells and RIBs lie across a fault that BLM considers a flow barrier. The reinjected or infiltrated dewatering water would not be able to return to the Archimedes block to replenish the depletions caused by dewatering. (However, see the discussion above and below on the connection between the Williamsburg and Archimedes block.)

8-12 The DSEIS does not consider whether returning dewatering water to the alluvium through RIBs will leach salts and nitrates into the underlying groundwater as similar technology has done at the Pipeline Deposit RIBs in Crescent Valley. This should be completed for the FSEIS. It is not acceptable to just install the RIBs and then potentially monitor the impacts planning to decide what mitigation will be necessary after problems commence.

8-13 The proposed reinjection wells are at the Collingwood Ranch. The wells screens of these are in the alluvium. These are currently domestic or irrigation wells. The DSEIS does not discuss the water quality issues that could result from mixing the dewatering water with the ambient water in the alluvium. However, it is usually preferable to inject the water to avoid the potential leaching mentioned above.

Jones completed a groundwater model to predict the impact of dewatering the Ruby Hills pit. Because the model results suggest there is little impact to the Diamond Valley basin from the dewatering, the remainder of this section briefly reviews that model and the results from that model. The actual model input was not reviewed for this analysis.

Responses to Letter 8

8-11 The rapid infiltration basins are located in the valley alluvium to facilitate rapid infiltration and avoid substantial evaporative losses of good quality dewatering water. Reinjection of water into the carbonate bedrock would be very slow due to the low permeability of the bedrock. Also, "replenishing" the water removed from the Archimedes Block would defeat the purpose of dewatering, which is to keep the East Archimedes Pit dry during mine operation.

8-12 A recently completed study by McClelland Laboratories (2005) titled: *Report on Column Percolation Soils Attenuation and Mobilization Test – Ruby Hill TP-6 Soils (1-11')* provides site-specific data on the possible leaching of salts by infiltrating mine water. This report showed, using column tests with soils from the area of the proposed infiltration basins and water representative of the water that would be pumped to the infiltration basins, that water infiltrating into the soils would not substantially leach salts. Only copper and magnesium showed any evidence of mobilization. TDS, zinc, and barium were attenuated. Effluent water from these column tests was within Nevada Profile II drinking water standards for all constituents (including nitrate). Thus, water quality in the alluvial aquifer should not be affected by water disposed of via the rapid infiltration basins. Text has been added to Section 3.4.2.1 of the Final SEIS to reflect the results of this study.

8-13 Groundwater quality in the alluvial aquifer is not expected to be affected by reinjection of water from the dewatering of the East Archimedes Pit because the water quality of the reinjected water and the groundwater in the alluvial aquifer are expected to be similar for all constituents.

Letter 8 Continued

8-14 WMC (2004) provides the conceptual model used for the groundwater model (Jones, 2004). Several aspects of the conceptual model incorrectly represent the system. The first is that recharge into the alluvium is misplaced. WMC (2004) correctly assumes that the recharge in the area occurs "as infiltration of surface water through stream channels" (WMC, 2004, page 37). This type of recharge has recently been recognized throughout northern Nevada at mines such as Pipeline and Goldstrike. But WMC then assumes that "[m]ost of the recharge…occurs downslope from the project area and will be largely unaffected by dewatering operations at the site" without justification. The 1:24000 scale maps showing the hills and mountains south of the project shows the drainages such as Austin Canyon open into valleys and canyons with wide bottoms, and likely alluvial material, well upstream of the Ruby Hills mine. There is sufficient alluvium upgradient of the project to absorb much of the runoff in the ephemeral drainages. Any recharge to the basin upslope of Ruby Hills could be intercepted by the mine. The model should reconsider this assumption.

8-15 The conceptual model also incorrectly argues that because there is a 90 foot difference in alluvial groundwater levels in the proposed pit and in the alluvium in Diamond Valley, the hydraulic connection is limited. Ninety feet over several miles is not a drop necessarily caused by a hydraulic disconnection. A bedrock outcrop may partially cause a disconnection, but it also appears that the alluvium at the project site connects due north with alluvium in Diamond Valley. See also the discussion above on the Holly Fault; there is a connection across the faults.

8-16 The conceptual model also indicates, contrary to the observance during test pumping of groundwater being drained from the alluvium into the bedrock, low permeability leads it to be "expected that the active dewatering component for the alluvium will be significant" (WMC, 2004, page 37). The DSEIS and WMC both suggest that there are few irrigation wells near the project, yet WMC (2004) reported water levels were dropping 1 foot per year near the project. There is saturated alluvium near the project. The rapid head drops under and in the alluvium will cause it to drain. This could result in a much higher inflow of water to the dewatering system than expected in this analysis. The alluvial aquifer is phreatic and the storage coefficient is likely to be at least 0.1 (Jones uses 0.2 for young alluvium in the model) which means that much more water will be released for a unit drop in head in the alluvium than will be released for a similar drop in bedrock head levels.

8-17 The model layout is sufficiently precise with cells being 100 feet square at the pit increasing to much larger sizes at the boundaries. The model layers, however, unnecessarily lump geologic layers. Layers 1 and 2 represent the bedrock in the defined blocks, but each is 1000 feet thick. Layer 2 extends to the bottom of the pit which indicates that most of the dewatering effects are simulated in layer 2. Layer 2 also combines at least the three productive layers observed in PW-1. Lumping such as this into one combined layer may be acceptable for a regional flow model, but it is unacceptable for a localized model such as used here. The response to pumping may differ substantially among layers. Layer 3 is the 1000 feet mostly below the pit. Layer 4 is the bottom layer and has been set to have a very low conductivity. It effectively is a no flow layer. This is a questionable assumption because the deeper geologic layers are part of the regional carbonate system which has substantial regional groundwater flow (WMC, 2004, page 36).

Responses to Letter 8

8-14 Recharge is difficult to quantify in any groundwater model. The bulk of the recharge would come from streams, as the comment states and as the model by Jones (2004) demonstrates. The separation of the bedrock in the Ruby Hill area into hydrogeologic blocks suggests that the pit would not receive bedrock recharge upgradient of the mine area because of the limited area of the Archimedes Block. Recharge upgradient of the Archimedes Block is not expected to reach the pit area due to flow restrictions between the blocks.

8-15 The groundwater model shows that pumping of the bedrock carbonate aquifers near the East Archimedes Pit would cause localized drawdown in the alluvial aquifer of Diamond Basin. Thus, the model does reflect an interconnection between the two aquifers. The calibration of the model is sufficient to indicate that the interconnection between bedrock and alluvial aquifers has been reasonably modeled.

8-16 The 1 foot per year drop in water levels referred to in this comment is due to irrigation pumping. Irrigation pumping will have a greater impact on any individual well in the valley alluvium than dewatering of the East Archimedes Pit. The impact of dewatering would not occur in the valley alluvium until late in mining, probably after year 5, would be limited, and would continue for 2 to 3 years. The degree of hydraulic communication between the Archimedes Block, the pit area alluvium, and the main Diamond Valley alluvial aquifer was reflected in the groundwater model. The model is calibrated to reproduce the measured responses to this stress. Mine-related impacts to water levels in the valley alluvium would be minor, as shown by Jones (2004).

8-17 Based on the 45-day pump test and the sensitivity analysis conducted as part of the modeling, the present grouping of geologic units in the groundwater model provided by Jones (2004) is considered adequate to model groundwater impacts for a period of groundwater pumping that would last 7 years.

Letter 8 Continued

8-18 Jones incorporates two dubious assumptions regarding recharge into the model. First, he assumes the drainages flow past the site and recharge occurs downgradient from the mine. As discussed above, this is incorrect. More critically for the results of the model, Jones modeled 19,000 af/y of recharge in the south part of the Diamond Valley basin being modeled. This is 63% of the total recharge expected for Diamond Valley from an area that is just 150 square miles, or 20% of the 735 square mile basin. Jones justifies this by claiming that the "model area consists of the upper portion of the basin, including the surface inflow point at Devil's Gate and thus should receive more of the groundwater recharge to the basin" (Jones, 2004, page 30). This is simply not correct because the east boundaries of the basin consist of the massif Diamond Mountains which rise to as high as 10,000 feet. Diamond Peak is at least six miles north of Eureka and the slopes off of the peak drain northwest away from the mine site. Both recharge high on the slopes and from the canyons that drain west from the Diamond Range will reach the basin north of the model domain. The Diamond Range extends dozens of miles to the north and provides a large recharge source all along its length. Devil's Gate is a minor pass that may allow a small amount of flow into Diamond Valley from Kobeh and Antelope Valleys. There is no chance that 63% of the recharge in Diamond Valley occurs in just 20% of the basin. Modeling that uses that proportion is also likely to be incorrect.

8-19 Reflecting the high potential conductivity of the carbonate system, the Fad shaft encountered very high inflow rates during its construction in 1948, as much as 9000 gpm, at the 2250 level which corresponds with the 4660 foot elevation. WMC (2004, page 21) describes the attempts to dewater this shaft. This would be in the third model layer.

8-20 The model uses faults as horizontal flow barriers. The figures in Jones (2004) (Figures 2.2 through 2.4) showing the barriers show a barrier corresponding to the Holly-150 fault, but the report does not indicate the conductance used for flow across the fault. As discussed above, the Holly-150 fault may slow the connection, but it in no way prevents flow. After seven years of dewatering pumpage, there may be a substantial flow across this fault and the modeling report fails to account for this. Figure 2.5 in Jones (2004), showing simulated pre-pumping water levels, does not show any significant head drops coinciding with most faults including the Holly-150 fault. But, Figure 3.6 showing the projected end of active dewatering groundwater drawdown show that drawdown decreases from 500 feet at the pit to less than 10 feet less than 800 feet from the projected pit boundary. The inclusion of low conductance across this fault artificially limits the drawdown due to dewatering.

8-21 Jones should rerun his model with a much increased conductance across the Holly-150 fault. It does not appear that his sensitivity analysis considered a strong connection across this fault. One "alternate model" was characterized by a "stronger hydraulic connection to the neighboring carbonate blocks upgradient" (Jones, 2004, page 60). This apparently means the Holly blocks, Graveyard block,, and or the Jackson block, not the Williamsburg block. Jones (2004) concludes that this scenario "over predicts" in these blocks. It is difficult to understand how one concludes it is an overprediction; comparing a model to the original calibration data is not appropriate for making this conclusion. This sensitivity analysis yields no useful information about the Holly-150 fault.

Responses to Letter 8

8-18 The model does not assume recharge downgradient from the mine. The total recharge to Diamond Valley was estimated at 30,000 acre-feet per year, including 9,000 acre-feet per year from surface and groundwater sources from adjacent basins and 21,000 acre-feet per year from precipitation in the basin (Eakin, T.E., D. Price, and J. R. Harrill 1976). Summary Appraisal of the Nation's Groundwater in the Great Basin Region. USGS Prof. Paper 813-G). Both the surface water and groundwater flow from adjacent basins enters Diamond Valley only through the southern part of the basin; therefore, the 9,000 acre-feet per year of flow from adjacent basins was included in the model area. Of the basin-wide 21,000 acre-feet per of recharge from precipitation, 10,000 acre-feet per year was included in the model area. Given the uncertain nature of recharge estimates, and the surrounding topography, the use of 10,000 acre-feet per year of recharge from precipitation in the southern part of Diamond Valley for modeling purposes is reasonable.

8-19 The Fad Shaft is adequately represented in the model based on its hydrogeologic location in the model. The shaft is not intended to be a monitoring point.

8-20 A sensitivity analysis was conducted on the fault conductances by Jones (2004) and reported in the modeling report. This sensitivity analysis showed that by using high conductances for the faults, and thus allowing more interaction between blocks for groundwater flow, that the model could not be adequately calibrated to observed monitor well data. This sensitivity analysis supported the original model design that used low conductance values for most faults.

8-21 Please see the response to comment 8-20.

Letter 8 Continued

8-22 There is also a fault boundary extending through the pit (Jones, 2004, Figure 2.3). The mine will bisect the fault that separates the Archimedes from the Graveyard block. Jones does not describe how the model handles this development. Figure 3.6, which shows the drawdown contours at the end of dewatering, may provide an insight to the modeling. The edge of the pit falls outside of the 100 foot drawdown contour, although the 20- and 10-foot drawdown contours extend a couple miles from the pit to the east. If the pit breaches the fault in the model, the drawdown would be much greater than shown here because otherwise the block will drain into the pit. One hundred feet of drawdown in the pit cannot be sufficient to keep the pit dry because it leaves the water level above the bottom of the pit. However, the extent of the 10- and 20-foot drawdown must reflect the conductance across the fault in the model. Again, the report should indicate the conductance values for each fault.

8-23 Jones (2004, page 26) used general head boundaries to simulate alluvial fan recharge in the model. This is a good modeling strategy. The report would be improved with a table showing the actual amounts of flow emanating from each recharge location. Also, on Table 2.3, Jones should provide the distance to the head specified for each boundary cell because GHBs respond much differently depending on this distance. If the distance is short, depending on the conductivity, the head either controls head in the nearby model domain or a substantial drawdown in the domain causes a large gradient to form which effectively increases the flow into the model domain. It may be realistic that pumping in the domain increases flow across the boundaries, but each location should be considered as to whether flow would increase. To assist the reviewer, Jones (2004) should add a table showing the cross-boundary flow for each GHB cell. Otherwise, it is impossible to review the efficacy of the model.

Pit Lake

8-24 The rock at this site contains very little potentially acid generative (PAG) material. Unless the little sulfide bearing rock is not mixed with the carbonate rock at the site, it will not cause any problems. There is less certainty of this in the pit lake, however.

8-25 The DSEIS presents the pit lake model very briefly. The following points should be added to the FSEIS to improve the reader's understanding

1. A figure of the volume/depth relationship should be included in the DSEIS to improve the understanding of the pit lake water balance. These figures are already included in Jones (2004), but because they are such basic information about the pit, they should be added to the DSEIS. The DSEIS does not even state the ultimate volume (13,000 af) or surface area (62 acres) for evaporation (142 af/y).

8-26

2. The figure showing the flux to the pit lake from different bench levels should be improved by adding the geologic layering to the figure. The reader could understand differing sources better. With the geochemistry of the formations, the reader could better understand the chemical flux to the pit lake.

8-27 The inflow used for the geochemical modeling may not adequately reflect the inflow to the pit lake. It does not reflect the weathering that occurs in the dewatered zone around the pit. The modeler combined water from MW-1, PW-1 from a 45-day pump test, MW-2 and MW-6 at the

Responses to Letter 8

8-22 The pit would breach the fault above the groundwater table; therefore, there would be no release of water into the pit. Conductance values for each fault barrier are presented in Table 2.2 of the Jones (2004) report. The modeling of the proposed mine pit, and the structures around the pit, are considered adequate as demonstrated by the model calibration.

8-23 The calibration of the model demonstrates that the water balance in the model, which includes flow from the general head boundaries, has been adequately represented. As a result, there is no need for a detailed water balance table in the report.

8-24 Comment noted.

8-25 Please see the Pit Lake Water Balance and Mass Loading Model subsection of Section 3.4.2.1 of the SEIS, which discusses the relationship between groundwater inflow rates and evaporation rates. Pit lake depth and surface area are presented.

8-26 The addition of geologic units to Figure 3.4-10 of the SEIS would not change the results of the analysis or the general understanding of groundwater flux through the pit benches. Additional technical information is available in the Jones (2004) report and the Schafer (2004) report.

8-27 The geochemical modeling accounts for inflow to the pit lake that results from runoff from weathered rock around the pit. The geochemical model also accounts for oxidation of the wall rock and incorporation of that oxidized material in the influent water chemistry. Please see Section 3.4 of the Schafer (2004) report for additional information.

Letter 8 Continued

8-27 rates of 10, 30, 30 and 30%, respectively (DSEIS, page 3.4-35). The idea is that the chemistry of these wells reflects the chemistry of the inflow to the pit lake. This is not correct because during pit construction and mining, the water table has been lowered around the pit. Air will have infiltrated the pore spaces of the rock and minerals around the pit. This will cause oxidation which will change the quality of the water seeping into the pit lake. The pit lake geochemical model should be rerun to accommodate this oxidation. Most other pit lakes models reviewed by this author, such as that at the Pipeline Mine, considered oxidation around the pit.

General NEPA Comments

8-28 The DSEIS wraps up two alternatives as one. Under the agency preferred alternative, the dewatering water will be disposed by either injection of the dewatering water into two irrigation wells or artificial recharge into rapid infiltration basins (RIBs). The reader is left considering two totally separate actions as one. See the General NEPA Comments section for more about the alternatives.

8-29 One of the proposals includes the use of the Collingwood wells for injection. The DSEIS should assess the effect of injecting this water on the water chemistry in this new location. The same recommendation holds for the potential rapid infiltration basins.

8-30 This DSEIS is deficient in its alternatives analysis. It considers and dismisses the backfill, partial backfill, and underground mining options without really analyzing them. Unfortunately, The BLM has a history of commonly dismissing any backfill options, unless it tries to bury underwater extremely PAG waste rock, as at the Phoenix project, if it requires the company to handle the rock twice. The BLM should not dismiss at least the partial backfill, to the water level, option without analyzing relative benefits of not creating a pit lake which will take 13,000 af of water out of use and cause about 300 af of evaporation every year. In a basin as overappropriated as Diamond Valley, there should be a significant benefit to preventing this loss of water, amounting to 1% of the total recharge, in perpetuity.

8-31 Regarding the backfill alternatives as well, the BLM could require some condemnation drilling in the bottom of the pit before backfill to ascertain whether any potential future ore will be buried. This should alleviate this concern about backfilling.

8-32 Additionally, it does not consider only partially mining the ore body or mining it at different rates. The BLM as usual has just accepted Homestake's proposal for mining. It may be possible that an alternative that accesses a certain portion of the ore body would have substantially less environmental impact. Or, it could be that mining the ore body faster would have substantially less impact. In this case, faster mining could save some water in the overappropriated Diamond Valley. It is does not follow that what is optimal for Homestake is optimal for Eureka, Diamond Valley or the remaining environment. At the very least, BLM should analyze the impacts of these alternatives to allow the decision based on a real comparison of lessened impacts.

8-33 The reasonably foreseeable affects does not consider the effect of mining deeper although this potential is implemented as a reason to not backfill the pit. It would be simple to add because Jones (2004) considered mining deeper. Because it appears to be more than just a remote

Responses to Letter 8

8-28 As discussed in the responses to comments 8-12 and 8-13, there would be no groundwater quality degradation due to infiltration or reinjection. As there would be no difference in potential impacts, both water handling methods are included in the Proposed Action to provide operational flexibility.

8-29 Please see the response to comments 8-12 and 8-13.

8-30 As stated in Section 2.5.1, Complete Pit Backfill, and Section 2.5.2, Partial Pit Backfill, these alternatives have been eliminated from analysis based on engineering, environmental, and economic considerations. This elimination is in accordance with CEQ guidelines (Sec. 1502.14).

8-31 As discussed in Section 2.51, Complete Pit Backfill, and 2.5.2, Partial Pit Backfill, Homestake's drilling program has identified potential economic gold mineralization at depth beneath the West and East Archimedes pits.

8-32 As described in Chapter 2 of the SEIS, the East Archimedes Pit has been designed to minimize surficial disturbance and to maximize safety. The design results in a narrow pit with steep slopes that limit the size and amount of mobile equipment able to operate safely. As no significant adverse impacts associated with the proposed pit design have been identified, the BLM has not identified the need to consider alternate pit sizes or mining rates.

8-33 Potential future mining at the Ruby Hill Mine was included in the SEIS as a reasonably foreseeable action (see Section 2.6.2, Reasonably Foreseeable Future Actions) and analyzed in the cumulative impact analyses in the applicable resource sections based on available information (see Chapter 3.0). As stated in Section 2.6.2, although additional drilling and design work would be needed to determine project feasibility, Homestake anticipates that the ore deposit likely would be mined using underground methods; associated dewatering volumes would be determined during baseline studies that would be conducted prior to the environmental permitting process.

Letter 8 Continued

8-33

possibility, under the RFFA analysis, the BLM should discuss at least whether the dewatering rate would be more or less if the pit were further deepened or if an underground mine were built into the bottom of the pit.

8-34

Another RFFA is that Homestake wants to acquire the additional public land at this minesite. Because Homestake already owns most of it, and whether it buys the remainder or not, the BLM should discuss what the long-term plans for the site will be. Eureka County deserves to know what future of the site will be. This is true whether the site will just effectively be vacant private land or if it will be developed. Vacant land could be an eyesore or an impediment to development. Substantial development on the other hand could tax the region's scarce water supply. This discussion should be added to the FSEIS.

8-35

Summary and Recommendations

This review has shown that the impacts of dewatering are likely to be much greater than predicted. The analysis relied on a hydraulic disconnect across the Holly and 150 faults. It also relied on unrealistic recharge estimates in the south part of the Diamond Valley. Finally, it does not appear to have accounted for breaching the fault lying east of the pit. All of these factors would limit the predicted extent of drawdown from dewatering in addition to the actual dewatering rate.

Prior to finalizing this project, the following should be completed:

1. The pump test should be rerun with pumping wells corresponding to each of the three primary producing layers separately. Each of the monitoring wells should be deepened and/or redeveloped so that the response in each potentially producing layer can be monitored. There should be additional wells installed in the Williamsburg, Bowman, and Graveyard blocks to increase the certainty associated with information concerning the connection among blocks.
2. After the pump test is rerun, the BLM should reconsider the blocks and connectivity across the blocks.
3. The groundwater model should be redesigned with more and better considered layers. Just dividing the bedrock into two 1000 foot thick layers does not represent the complexities extant beneath this site.
4. The groundwater model should also have much less recharge than used in this analysis. It is not credible that just 20% of the basin should have 63% of the entire basin recharge.
5. The groundwater model should account for a much greater connection between the Archimedes and Williamsburg blocks. The model could be calibrated with the transient pump test data, which will have been repeated, to get the cross-fault flow correct.
6. The DSEIS should consider the different recharge methods and partial backfill as different alternatives and deepening the pit as a RFFA.
7. Comments provided above in this review should be incorporated in the final hydrology and FSEIS.

Responses to Letter 8

8-34 As stated in Section 3.12.2.1 of the SEIS, following closure and reclamation, public lands in the project area would be returned to their pre-mining land use as rangeland, wildlife habitat, and dispersed recreation, with the exception of the portion of the pit expansion area that would be restricted for safety reasons. As stated in Section 3.12.3, Cumulative Impacts, the potential future land sale of approximately 400 acres of public land would result in the long-term loss of public access to these lands for recreation.

8-35 The BLM has reviewed the supporting technical documents for the project and has determined that they are adequate for purposes of analyzing the potential impacts of the proposed project. Rerunning the pumping test and redesigning the groundwater model would not appreciably change the results and therefore the analyses presented in the SEIS. See the responses to comments 8-28, 8-30, and 8-33 relative to alternatives analyses.

Letter 8 Continued

References

Jones, M.A., 2004. East Archimedes Project, Groundwater Flow Model. Prepared for Ruby Hill Mine, Eureka, NV. Albuquerque, N.M.

Water Management Consultants (WMC), 2004. East Archimedes Project, Assessment of the Hydrogeologic Conditions and Dewatering Feasibility. Prepared for Ruby Hill Mine, Eureka, NV. Reno, Nevada.

Letter 9

Leonard Fiorenzi
Box 193
Simpson creek
Eureka Nev. 89316

Sirs

Please accept this letter as my comments on the draft Supplemental E.I.S. for the Ruby hill mine project here in Eureka.

I own and live on a portion of

9-1 land located in the NW1/4 SW1/4 Section 5 T19N R 54E. MDM.

Located on this property are three springs, one supplys water to my house, one to stock correl's and one is used for stock water and irragation of 75+ acres of ground.

These springs are not identified any where in your document. Being located within one mile of your "drawdown line" it seems that your document is seriously flawed. How many other springs, seeps has your consultant missed that may be impacted by this project?

Because of spring location in the bottom of the canyon and the distance from your "drawdown line" map, water drawdown in this area is passable and small drawdowns will greatly effect my spring's out put.

I therefore request that springs on my property be identified and mitigation measure's be addressed in the final E.I.S.

Responses to Letter 9

9-1 As stated in Section 3.4.1.1, Surface Water, of the SEIS, springs within 3 miles of the project area (which covers the area within the projected 10-foot groundwater drawdown contour shown in Figures 3.4-5 and 3.4-6) previously were identified by WESTEC (1996a,b). Based on the property location provided in the comment, the commentor's property is located greater than 3 miles from the project area; hence, the noted springs are outside of the projected 10-foot groundwater drawdown area and were not included in the original spring inventory. However, additional selected spring locations have been added to Figures 3.4-5 and 3.4-6 of the Final SEIS based on latitude/longitude locations provided by Eureka County. (Also see Table 3.4-A of the Final SEIS.) Based on the spring locations, there appears to be no structural connection to the Archimedes Block; therefore, it is considered unlikely there would be any impact to the spring. Also, please see the response to comment 6-6 relative to the impact evaluation in relation to the projected 10-foot drawdown area.

Letter 9 Continued

9-2 I Support The mining interest in This Area but, with The Exclusion of These waters in The document I question The Accuracy of The whole document and request That The draft be Completly reviewed again By your consultants and re-realeased for public comment,

Leonard Fiorenze

Responses to Letter 9

9-2 Please see the response to comment 9-1.

Letter 10

USDI, Bureau of Land Management **Battle Mountain Field Office**

For the BLM to formally consider your concerns for the Ruby Hill Mine Expansion - East Archimedes Project Supplemental Environmental Impact Statement (SEIS) written comments are required. To ensure that they are considered, you should provide your comments by ***April 25, 2005.*** Please submit your comments to: Bureau of Land Management, Battle Mountain Field Office, Attn: Caleb Hiner, 50 Bastian Road, Battle Mountain, NV 89820. He may be reached at (775) 635-4052. **In order to continue receiving information and future mailings about the SEIS, you must ask to be added to the official mailing list by submitting this form by April 25, 2005.**

Public comments submitted for this SIES review, including names and street addresses of respondents, will be available for public review at the Battle Mountain Field Office, 50 Bastian Road, Battle Mountain, NV 89820, during regular business hours (7:30 AM to 4:30 PM), Monday through Friday, except federal holidays. Individual respondents may request confidentiality. If you wish to withhold your name or address from public review or from disclosure under the Freedom of Information Act, you must state this prominently in your written comments. Such requests will be honored to the extent allowed by law. All submissions from organizations or businesses, and from individuals identifying themselves as representatives or officials of organizations or businesses, will be made available for public inspection in their entirety.

Your Name TONY CARONE Today's Date 4-20-05

Please indicate your affiliation by checking one of the following boxes:

- ☑ Individual (no affiliation)
- ☐ Federal, State, Tribal, or local government
- ☐ Elected Representative
- ☑ Private Organization
- ☐ Citizen's Group
- ☐ Regulatory Agency

Name of organization, government, group, or agency (if applicable) NWTF NATIONAL TURKEY WILDLIFE FED.

Mailing Address P.O. BOX 1222

City/State/ZIP BATTLE MT. NEVADA 89820

Telephone (optional)

Would you like to be added to/or remain on the BMFO Ruby Hill Expansion SIES mailing list to receive future project-related information? Yes ☑ No ☐

Please write your comments below. Please circle the appropriate category below. Attach additional pages if necessary.

Access/transportation	Social and economic concerns
Energy	Soil, water, air, and visual resources
Fire management	Vegetation/noxious weeds
Historical, cultural and Paleontological resources/traditional values	Wild horses and burros
Land Tenure	Wilderness, wilderness study areas and other special designations
Livestock grazing	Wildlife/sensitive species
Minerals	Other
Recreation	

10-1 AS A NATIVE NEVADAN SUPORT the ECONOMIC IMPACT to the STATE AND County's COMERACE, AND ENCOURAGE the E.S AND RECORD OF DECISON be PASSED IN A TIMELY PROCESS AND be A SUCESSFUL MINE.

Responses to Letter 10

10-1 Comment noted.

Letter 11

USDI, Bureau of Land Management — **Battle Mountain Field Office**

For the BLM to formally consider your concerns for the Ruby Hill Mine Expansion - East Archimedes Project Supplemental Environmental Impact Statement (SEIS) written comments are required. To ensure that they are considered, you should provide your comments by ***April 25, 2005.*** Please submit your comments to: Bureau of Land Management, Battle Mountain Field Office, Attn: Caleb Hiner, 50 Bastian Road, Battle Mountain, NV 89820. He may be reached at (775) 635-4052. **In order to continue receiving information and future mailings about the SEIS, you must ask to be added to the official mailing list by submitting this form by April 25, 2005.**

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Your Name Melodie Nicholes Today's Date 4-21-05

Please indicate your affiliation by checking one of the following boxes:

- ☑ Individual (no affiliation)
- ☐ Federal, State, Tribal, or local government
- ☐ Elected Representative
- ☐ Private Organization
- ☐ Citizen's Group
- ☐ Regulatory Agency

Name of organization, government, group, or agency (if applicable) ________

Mailing Address P.O. Box 410

City/State/ZIP Eureka NV 89316

Telephone (optional)________

Would you like to be added to/or remain on the BMFO Ruby Hill Expansion SIES mailing list to receive future project-related information? Yes ☐ No ☑

Please write your comments below. Please circle the appropriate category below. Attach additional pages if necessary.

Access/transportation
Energy
Fire management
Historical, cultural and Paleontological resources/traditional values
Land Tenure
Livestock grazing
Minerals
Recreation
Social and economic concerns
Soil, water, air, and visual resources
Vegetation/noxious weeds
Wild horses and burros
Wilderness, wilderness study areas and other special designations
Wildlife/sensitive species
Other

11-1 Ruby Hill Mine Has Been good for the Economics ~~and~~ Development of Eureka Co. They Have been Very Responsible in their mining Practice. They show great concern for the Environment in all of their mining Activities.

Responses to Letter 11

11-1 Comment noted.

Letter 12

USDI, Bureau of Land Management **Battle Mountain Field Office**

For the BLM to formally consider your concerns for the Ruby Hill Mine Expansion - East Archimedes Project Supplemental Environmental Impact Statement (SEIS) written comments are required. To ensure that they are considered, you should provide your comments by ***April 25, 2005.*** Please submit your comments to: Bureau of Land Management, Battle Mountain Field Office, Attn: Caleb Hiner, 50 Bastian Road, Battle Mountain, NV 89820. He may be reached at (775) 635-4052. **In order to continue receiving information and future mailings about the SEIS, you must ask to be added to the official mailing list by submitting this form by April 25, 2005.**

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Your Name Bryan Mahoney Today's Date 4/21/05

Please indicate your affiliation by checking one of the following boxes:

- ☒ Individual (no affiliation)
- ☐ Federal, State, Tribal, or local government
- ☐ Elected Representative
- ☐ Private Organization
- ☐ Citizen's Group
- ☐ Regulatory Agency

Name of organization, government, group, or agency (if applicable) ________

Mailing Address P O Box 1014

City/State/ZIP Eureka, NV 89316

Telephone (optional) 775 237 5037

Would you like to be added to/or remain on the BMFO Ruby Hill Expansion SIES mailing list to receive future project-related information?

Yes ☒

No ☐

Please write your comments below. Please circle the appropriate category below. Attach additional pages if necessary.

Access/transportation	Social and economic concerns
Energy	Soil, water, air, and visual resources
Fire management	Vegetation/noxious weeds
Historical, cultural and Paleontological resources/traditional values	Wild horses and burros
Land Tenure	Wilderness, wilderness study areas and other special designations
Livestock grazing	Wildlife/sensitive species
Minerals	Other
Recreation	

12-1 This is a wonderful project & will be good for the entire community. Please Approve the project.

Responses to Letter 12

12-1 Comment noted

Letter 13

USDI, Bureau of Land Management **Battle Mountain Field Office**

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Your Name Bryant Barnson Today's Date 4-22-04

Please indicate your affiliation by checking one of the following boxes:

- ☐ Individual (no affiliation)
- ☐ Federal, State, Tribal, or local government
- ☐ Elected Representative
- ☐ Private Organization
- ☐ Citizen's Group
- ☐ Regulatory Agency

Name of organization, government, group, or agency (if applicable) ____

Mailing Address P.O. Box 335 Ruth NV

City/State/ZIP Ruth NV

Telephone (optional) 775-289-2058

Would you like to be added to/or remain on the BMFO Ruby Hill Expansion SIES mailing list to receive future project-related information?

Yes ☒
No ☐

Please write your comments below. Please circle the appropriate category below. Attach additional pages if necessary.

Access/transportation
Energy
Fire management
Historical, cultural and Paleontological resources/traditional values
Land Tenure
Livestock grazing
Minerals
Recreation
Social and economic concerns
Soil, water, air, and visual resources
Vegetation/noxious weeds
Wild horses and burros
Wilderness, wilderness study areas and other special designations
Wildlife/sensitive species
Other

13-1 I am Happy to see the expansion of Ruby Hill Mine it will mean Groth for Eureka. I have seen the Mine operations since it started in 1997 and have Always been Pleased on how well They Reclaim as They Mine. They seem to have our environment and Safety in mind. I am 100% in favor of Ruby Hill Mine operating in the Future

Responses to Letter 13

13-1 Comment noted.

Letter 14

USDI, Bureau of Land Management **Battle Mountain Field Office**

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Your Name Clayton Nicholes Today's Date 4-21-05

Please indicate your affiliation by checking one of the following boxes:

- ☒ Individual (no affiliation)
- ☐ Federal, State, Tribal, or local government
- ☐ Elected Representative
- ☐ Private Organization
- ☐ Citizen's Group
- ☐ Regulatory Agency

Name of organization, government, group, or agency (if applicable) ____

Mailing Address P.O. Box 410

City/State/ZIP Eureka Nv. 89316

Telephone (optional) 237-5083

Would you like to be added to/or remain on the BMFO Ruby Hill Expansion SIES mailing list to receive future project-related information?

Yes ☐

No ☐

Please write your comments below. Please circle the appropriate category below. Attach additional pages if necessary.

Access/transportation
Energy
Fire management
Historical, cultural and Paleontological resources/traditional values
Land Tenure
Livestock grazing
Minerals
Recreation
Social and economic concerns
Soil, water, air, and visual resources
Vegetation/noxious weeds
Wild horses and burros
Wilderness, wilderness study areas and other special designations
Wildlife/sensitive species
Other

14-1 I Have worked for Ruby Hill mine for the Last 5+ years In my Experiance they Have shown Exceptional Responsibility In every aspect of their mining activity's. They Have also Been very good for the Economy of Eureka County. I feel that they Deserve every opertunity to continue their mining in Eureka County.

Responses to Letter 14

14-1 Comment noted.

Letter 15

USDI, Bureau of Land Management **Battle Mountain Field Office**

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Your Name Dennis Gordon Today's Date 4-21-05

Please indicate your affiliation by checking one of the following boxes:

- ☒ Individual (no affiliation)
- ☐ Federal, State, Tribal, or local government
- ☐ Elected Representative
- ☐ Private Organization
- ☐ Citizen's Group
- ☐ Regulatory Agency

Name of organization, government, group, or agency (if applicable)

Mailing Address P.O. Box 691

City/State/ZIP EUREKA Nv 89316

Telephone (optional) 775-237-5656

Would you like to be added to/or remain on the BMFO Ruby Hill Expansion SIES mailing list to receive future project-related information?

Yes ☒

No ☐

Please write your comments below. Please circle the appropriate category below. Attach additional pages if necessary.

- Access/transportation
- Energy
- Fire management
- Historical, cultural and Paleontological resources/traditional values
- Land Tenure
- Livestock grazing
- Minerals
- Recreation
- Social and economic concerns
- Soil, water, air, and visual resources
- Vegetation/noxious weeds
- Wild horses and burros
- Wilderness, wilderness study areas and other special designations
- Wildlife/sensitive species
- Other

15-1 BARRICK RUBY Hill HAS HELPED MY FAMILY AND FRIENDS ECONOMICALLY I FEEL THE MINE IS A POSITIVE ASSET, TO THE People and Community

Responses to Letter 15

15-1 Comment noted.

Letter 16

USDI, Bureau of Land Management **Battle Mountain Field Office**

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Your Name Gary Frost Today's Date 4-21-05

Please indicate your affiliation by checking one of the following boxes:

- ☑ Individual (no affiliation)
- ☐ Federal, State, Tribal, or local government
- ☐ Elected Representative
- ☐ Private Organization
- ☐ Citizen's Group
- ☐ Regulatory Agency

Name of organization, government, group, or agency (if applicable) ______

Mailing Address P. O. Box 294

City/State/ZIP Eureka, Nevada 89316

Telephone (optional) 775 237 5097

Would you like to be added to/or remain on the BMFO Ruby Hill Expansion SIES mailing list to receive future project-related information?

Yes ☑

No ☐

Please write your comments below. Please circle the appropriate category below. Attach additional pages if necessary.

Access/transportation
Energy
Fire management
Historical, cultural and Paleontological resources/traditional values
Land Tenure
Livestock grazing
Minerals
Recreation
Social and economic concerns
Soil, water, air, and visual resources
Vegetation/noxious weeds
Wild horses and burros
Wilderness, wilderness study areas and other special designations
Wildlife/sensitive species
Other

16-1 The Proposed Expansion and Resulting Development will Bring Economic value and growth to The surrounding areas

16-2 Demonstrated stewardship will ensure That The Environmental Impact will Be minimal and The community Benefit will out weigh The Temporary Disturbance

Responses to Letter 16

16-1 Comment noted

16-2 Comment noted.

Letter 17

USDI, Bureau of Land Management **Battle Mountain Field Office**

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Your Name Karl Marlowe Today's Date 21-Apr. 05

Please indicate your affiliation by checking one of the following boxes:

- ☐ Individual (no affiliation)
- ☐ Federal, State, Tribal, or local government
- ☐ Elected Representative
- ☐ Private Organization
- ☐ Citizen's Group
- ☐ Regulatory Agency

Name of organization, government, group, or agency (if applicable) ____

Mailing Address 13591 Gold Run Dr

City/State/ZIP Reno NV 89521

Telephone (optional) ____

Would you like to be added to/or remain on the BMFO Ruby Hill Expansion SIES mailing list to receive future project-related information?

Yes ☐

No ☒

Please write your comments below. Please circle the appropriate category below. Attach additional pages if necessary.

Access/transportation
Energy
Fire management
Historical, cultural and Paleontological resources/traditional values
Land Tenure
Livestock grazing
Minerals
Recreation

Social and economic concerns
Soil, water, air, and visual resources
Vegetation/noxious weeds
Wild horses and burros
Wilderness, wilderness study areas and other special designations
Wildlife/sensitive species
Other
General

17-1 ~~Phase~~ Mining and reclamation of the West Archimedes deposit is a first class example of ~~the~~ integrating final reclamation plans in the earliest phases of mine design. The Proposed East Archimedes expansion incorporates the same level of forward planning to minimize impacts during and after mining.

Responses to Letter 17

17-1 Comment noted.

Letter 18

USDI, Bureau of Land Management **Battle Mountain Field Office**

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Your Name Melinda Daubenschmidt Today's Date 4/21/05

Please indicate your affiliation by checking one of the following boxes:

- [x] Individual (no affiliation)
- [ ] Federal, State, Tribal, or local government
- [ ] Elected Representative
- [ ] Private Organization
- [ ] Citizen's Group
- [ ] Regulatory Agency

Name of organization, government, group, or agency (if applicable) ______

Mailing Address PO Box 814

City/State/ZIP Eureka, NV 89316

Telephone (optional) (775) 237-5425

Would you like to be added to/or remain on the BMFO Ruby Hill Expansion SIES mailing list to receive future project-related information?

Yes ☐

No ☐

Please write your comments below. Please circle the appropriate category below. Attach additional pages if necessary.

Access/transportation
Energy
Fire management
Historical, cultural and Paleontological resources/traditional values
Land Tenure
Livestock grazing
Minerals
Recreation

Social and economic concerns
Soil, water, air, and visual resources
Vegetation/noxious weeds
Wild horses and burros
Wilderness, wilderness study areas and other special designations
Wildlife/sensitive species
Other

18-1 Ruby Hill Mine, whether owned by Homestake or Barrick has enhanced mine and my husbands life in many ways. We are strongly for the re-opening of the project

Responses to Letter 18

18-1 Comment noted.